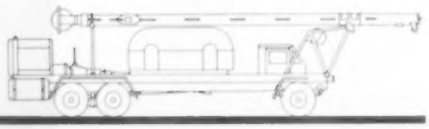
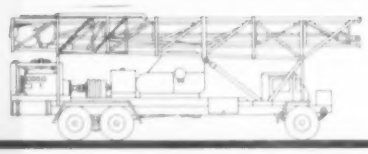
the OIL AND GAS JOURNAL

NOW A **midget** FRANKS *Clipper*

with either POLE MAST



or TELESCOPING DERRICK



The Clipper pictured at left is Franks "Giant" model, capable of servicing the deepest wells. There are models to fit various depth capacities and needs.

New Aluminum Derrick Available

...for well servicing and workover work 4,000 to 9,000 ft.

Following the success of its heavy duty Clipper line of self-propelled units in proving faster and more economical in well servicing, rig-up, and moving, Franks has now designed a "MIDGET" CLIPPER (single or double drum) with either 65 ft. pole mast, or 66 ft. telescoping derrick.

The unit has more power than has been previously offered on a truck-mounted servicing unit of equivalent weight. It is legal in weight and all road length and width measurements in all oil producing states.

The Midget Clipper is available with hydraulic drive for: rotary table; Guiberson Head for reverse circulation; tongs; raising and lowering derrick. Air rod lift transfer available on derrick type unit. Derrick requires no guy lines to ground. As with all Franks Clippers, the Midget affords perfect location "spotting" as it heads into location instead of backing in.

It is a unit primarily built for well servicing, although it is completely self-propelled using the industrial type power plant to move the unit from location to location.

Like all Franks equipment, the Clippers are of rugged build which assures long life and less maintenance.

Improved, simplified FULL AIR clutch standard on all Clipper models.

All Franks units now have NEW hardened brake flanges.

FRANKS MFG CORP
WELL SERVICING AND DRILLING UNITS
TULSA, OKLAHOMA

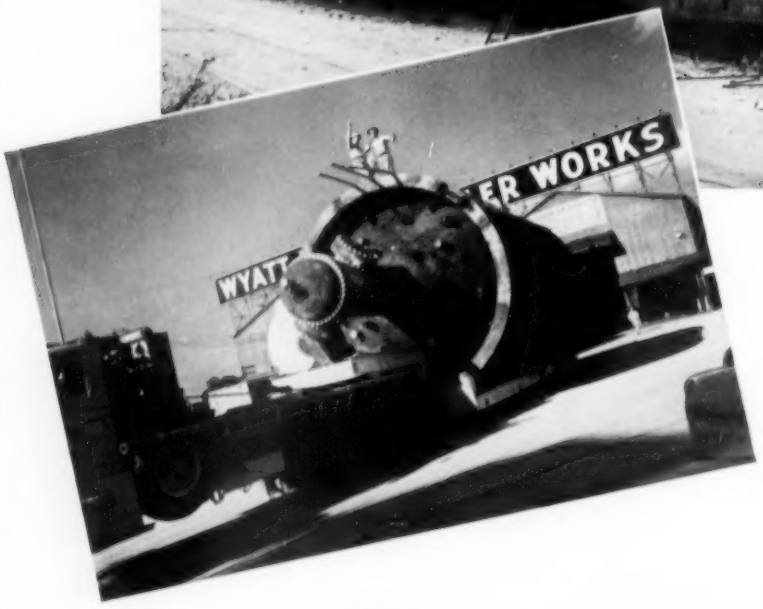
State whether you are interested in pole mast or derrick type in writing for complete specifications on the new Franks Midget Clipper.

FRANKS MFG. CORP.

"on the SPOT" FIELD SERVICE

Box 3218 Whittier Sta. • Tulsa, Oklahoma • Export: 149 Broadway, New York

Destination . . . Service



• Whatever the transportation and however far their journey, the products of Wyatt's Fabrication have one final destination . . .
Service to the Processing Industries.

MANUFACTURERS AND ERECTORS SINCE 1913

Wyatt's
HOUSTON-DALLAS-NEW YORK-TULSA

the OIL AND GAS JOURNAL NOVEMBER 29, 1954 VOL. 53 NO. 30

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In Brief . . .

1. VERSATILE PROCESS . . . Data on fluid-coking 10 residuum stocks covering a wide range of feed-stock quality show that the fluid-coking process is easily adapted to operation on any residuum stock. Coke production is less, gas-oil yields are higher, and product-gasoline octane yields are higher than those obtained in corresponding operations on delayed-coking units.

2. GREATER RESERVES . . . These six steps are outlined for the discovery of greater reserves in California: (1) enactment of legislation enforcing efficient production methods; (2) improved recovery techniques; (3) discovery of pools in and extensions of present fields; (4) discovery of large fields inshore; (6) discovery and development of fields offshore; and (6) application of secondary-recovery methods.

3. PROVED TECHNIQUE . . . Over the past few years, thousands of drill collars have been stub-ended and pressure-welded and have performed satisfactorily under the most rigorous of drilling conditions. Reasons for the success of the technique are: (1) material at the weld is completely homogeneous; (2) mild heat is applied evenly with a minimum of developed internal stresses and minimum grain growth; and (3) the process is equally adaptable to welding steels of high or low hardness and of varying carbon or alloying content.

4. ATOMS FOR FLOODS . . . The radioactive-isotope injection method, in combination with the conventional gamma-ray log instrument, is now being used to find out just where in the geologic section of a water-flood-injection well the water is penetrated. By running the radioactive profile series of logs, it can be determined which sands are taking the greater part of the fluid and how much fluid each sand is receiving.

5. VISCOUS-CRUDE FLOW . . . First requisite in planning a pipeline to handle viscous oils is conducting laboratory tests at various temperatures to determine gravity and viscosity values for use in the heat-loss formula. Also needed is information on atmospheric temperatures, types and conditions of soils, and elevations along the route.

WITH THE

"ZC"

You can mount a Fairbanks-Morse "ZC" engine on your pumping jack the way you want it. Clutch and sheave can be mounted on either side of the engine *without sacrifice in efficiency, smoothness or balance.* With the famous Fairbanks-Morse extra-heavy, large double flywheels, there is always one flywheel between engine and load. You get perfect balance, poised or rolling . . . smoother, more efficient, more economical operation.

There is a type and size "ZC" engine to exactly fit your requirements. See your local supply store or write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

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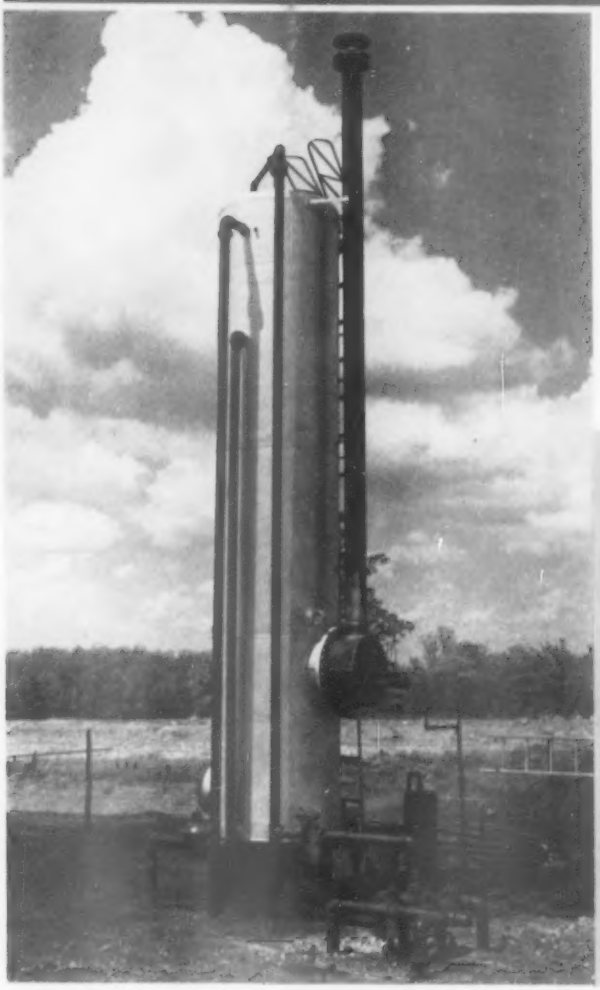
a name worth remembering when you want the best

OIL FIELD EQUIPMENT · PUMPS · SCALES · ELECTRIC MOTORS · GENERATORS · LIGHT PLANTS · DIESEL, DUAL FUEL & GASOLINE ENGINES · MAGNETOS · DIESEL LOCOMOTIVES

90% of Locations needing a Treater can be handled by this M-C. *Low Cost Unit*



The Maloney-Crawford IG type treater pictured is a low cost treater designed to treat loose type emulsions which require the addition of heat and settling time to break the water out of the emulsion. It has:

1. A large oil settling area
2. Over ample furnace
3. 25 lb. working pressure
4. High siphon location, discouraging tampering after level is set.

BE SURE YOU ARE NOT BUYING MORE TREATER THAN YOU NEED

Why pay more for a more expensive treater if the M.-C. IG type will solve your problem.

Ask a M.-C. representative to advise you whether your need is within the 90% of locations this M.-C. IG low cost treater will handle effectively.

MALONEY - CRAWFORD TANK & MANUFACTURING CO.

FACTORY AND GENERAL OFFICE: 38 North Peoria—Box 659—Tulsa, Oklahoma
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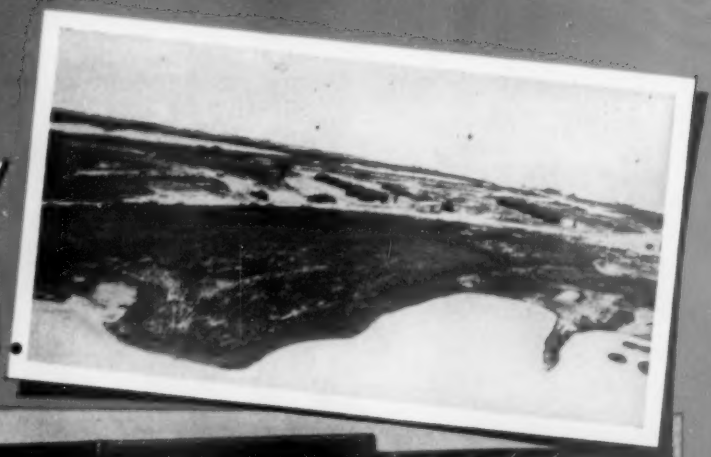
TEXAS PANHANDLE REPRESENTATIVE: Atlas Tank Company, Pampa, Texas

MALONEY - CRAWFORD TANK & MFG. CO.

The Oil and Gas Journal, published Mondays, copyright 1954, by The Petroleum Publishing Company. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $4 yearly.

Alone on an Island

16 hours per day...



This "Oilwell" DGE-250 Two Stage Compressor Unit is designed to handle 1,090,000 cubic feet of gas per day with 250 input horsepower. Horizontal fan provides forced air flow vertically through radiator cores, so that prevailing winds do not affect cooling efficiencies.

. . . called for gas-handling equipment that could do the job by itself . . . that's why Mel Dar Corporation engineers selected this "Oilwell" Direct-Drive Compressor Unit for . . .

Boosting Gas into the Transmission Line

Some 17 Miles out in the gulf near Corpus Christi, Texas, a field of 155 producing wells is centered around a 160-acre island which gets drenched by mist and spray from every passing storm. Nobody lives there. The production men make daily trips from the mainland by launch. The rest of the time this installation operates unattended.

Because of their fully-enclosed weatherproof design, "Oilwell" DGE Compressor Units with direct drive between prime mover and compressors, meet the all-weather operating requirements of such isolated locations perfectly.

On this lease, all of the wells produce wet gas which comes from separators at approximately 30 psi and is compressed by this two-stage unit to approximately 760 psi. Following passage through an after-cooler and dehydrating unit, it is then mixed with dry gas from other wells and injected into Tennessee Gas Transmission Company lines for transmission to northeastern markets.

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. . . let an "Oilwell" representative quote on the "Oilwell" Unit that meets your requirements most economically, throughout the 20 to 300 h.p. range.

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USS

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TRADE MARK

UNITED STATES STEEL

Let's get technical about WALWORTH LUBRICATED PLUG VALVES for pipeline service

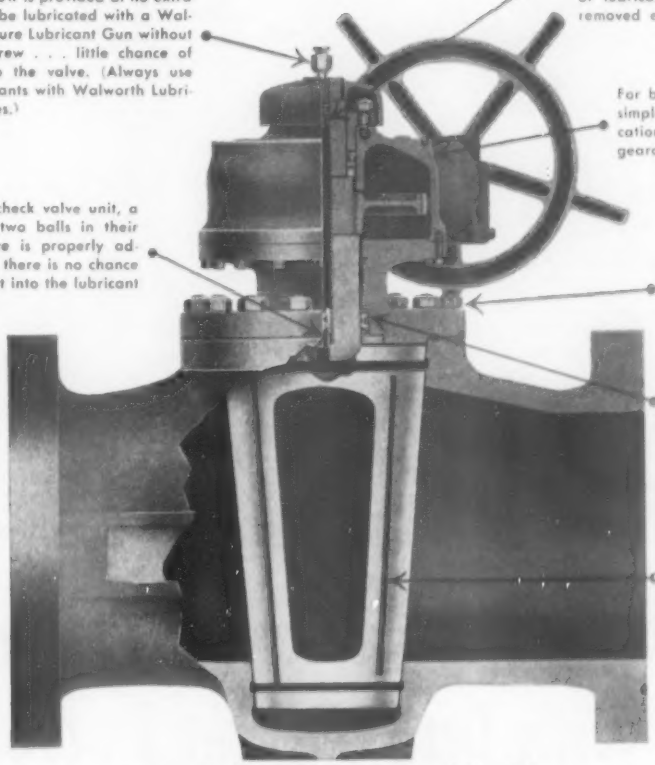
Combination button-head lubricant fitting and lubricant screw is provided at no extra cost. Valves can be lubricated with a Walworth High Pressure Lubricant Gun without removing the screw . . . little chance of grit getting into the valve. (Always use Walworth Lubricants with Walworth Lubricated Plug Valves.)

An added safety feature in the form of a groove cut part way up side of the lubricant-fitting screw allows the operator to observe any tendency of lubricant to blow out before the screw is removed entirely.

For buried pipelines — yoke design permits simple attachment of handwheel and lubrication extensions without modifying the gearcase.

In the stainless steel check valve unit, a transverse pin holds two balls in their seats. When the valve is properly adjusted and lubricated, there is no chance for line pressure to get into the lubricant system.

Standard bolt threads, rather than fine threads, mean easy replacement of nuts and bolts from local stocks.



Two overlapping Teflon packing rings form an effective seal against possible leakage without "grabbing" the plug shank. Low breakout torque . . . plug turns easier. Packing serves only as a seal and is not used to hold the plug in its seat.

Lubricant grooves completely frame the port openings and encircle the plug at the top and bottom assuring a tight seal against leaks. Bottom circumferential groove is separate from, but connected with, the lubricant well.

Other Walworth Lubricated Plug Valves include Single Gland and Regular Gland types. Sizes to 30 inches. Pressures to 5000 psi and for vacuum service.

Cutaway of a 24-inch Walworth Lubricated Plug Valve

Without exception, a Walworth Ball Bearing Lubricated Plug Valve is easier to operate and maintain than any other type of rotary-action, sealed valve available today for pipeline service. Design features pointed out here show just a few advantages of Walworth Ball Bearing Lubricated Plug Valves.

Many pipeline companies throughout the world use Walworth valves for handling gas, crude, and finished products. Investigate the line of Walworth valves for your own needs. See your Walworth Distributor, or write for literature: Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.

Use pigs or scrapers?

Walworth Type 49 Cast Steel Gate Valves are designed on the throughport principle to permit passage of pigs and scrapers — may be installed without regard to flow direction. Sizes 2 to 30 inches inclusive. Ask for literature.

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Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

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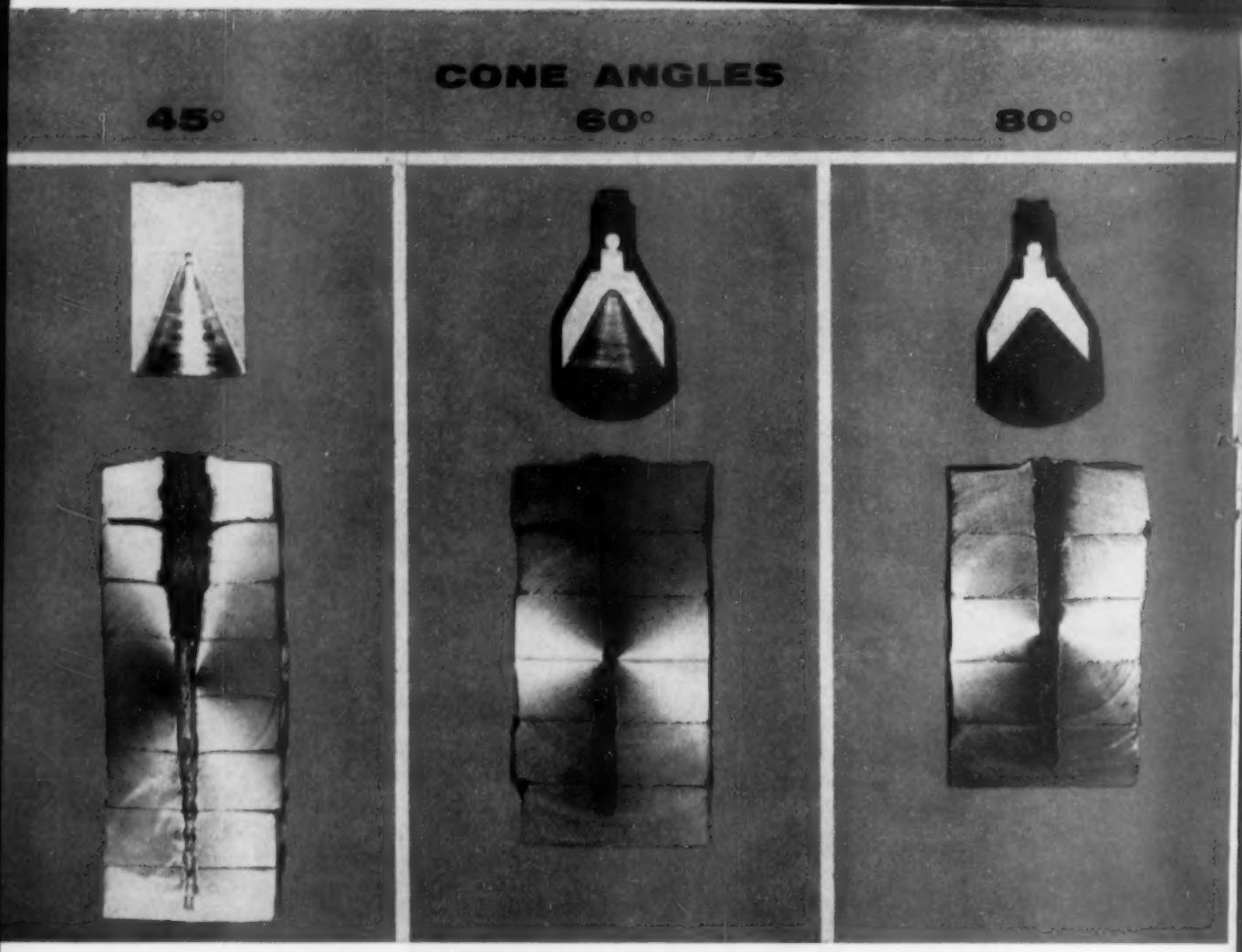

Why you get consistently deeper penetration with Du Pont Jet Perforators

Research determined the most practical cone angle

Among the factors that affect the performance of any perforator is the angle of the copper cone. Researchers conducted precise tests with cones shaped to every practical angle—three of which are shown above. Charges were shot into inch-thick steel blocks. You can see that a more acute angle of cone seems to bring deeper penetration. But the longer cone required a heavier charge of explosive, and the length of the assembly became impractically long for use in existing carriers. It was necessary to strike a balance between cone length and cone angle. This balance worked out best at a cone angle of 60°, which is now standard in Du Pont Jet Perforators.

Exacting Du Pont research has developed Jet Perforators that you can count on for the best possible results *consistently*. Every shot makes a deep, clean, effective hole . . . readily pierces up to three strings of casings and goes well beyond range of mud damage. Du Pont Jet Perforators leave practically no burr in the casing, so packers and other tools can be lowered through the perforated zone without scraping. And Du Pont Jets keep their peak efficiency even at well temperatures over 300°F.

Top service organizations use Du Pont Jet Perforators consistently to insure deep, dependable penetration, greatest over-all economy. Specify them for your next perforating job. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

DU PONT

JET PERFORATORS

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. . . *THROUGH CHEMISTRY*

Illustrated here are pictorial index pages from Grinnell's 92-page hanger catalog.

Grinnell has

pipe hangers and supports for every piping requirement, from simple water piping to high pressure, high temperature steam lines. No other company, anywhere, makes as complete a line of pipe hangers.

the **right** pipe hanger

If some detail of piping arrangement should make it necessary to deviate from hangers of standard design, it is important to remember that Grinnell will design and manufacture hangers to meet your special requirements. This is a service Grinnell freely offers.

to help you

Through Grinnell's efficient coast-to-coast system of strategically located warehouses and jobbers, you can purchase Grinnell Hangers "out of stock", anywhere. No other manufacturer of pipe hangers offers a distribution set-up as thorough or complete.

with every pipe hanging job!

Grinnell is ready to cooperate on all your pipe hanging assignments. For example, Grinnell will assist in the preparation of pipe suspension specifications. In addition, Grinnell, alone, of all manufacturers offers experienced field engineering service — maintains a staff of engineers who are ready to assist "on the job" with any problems in the erection of pipe hangers and supports.

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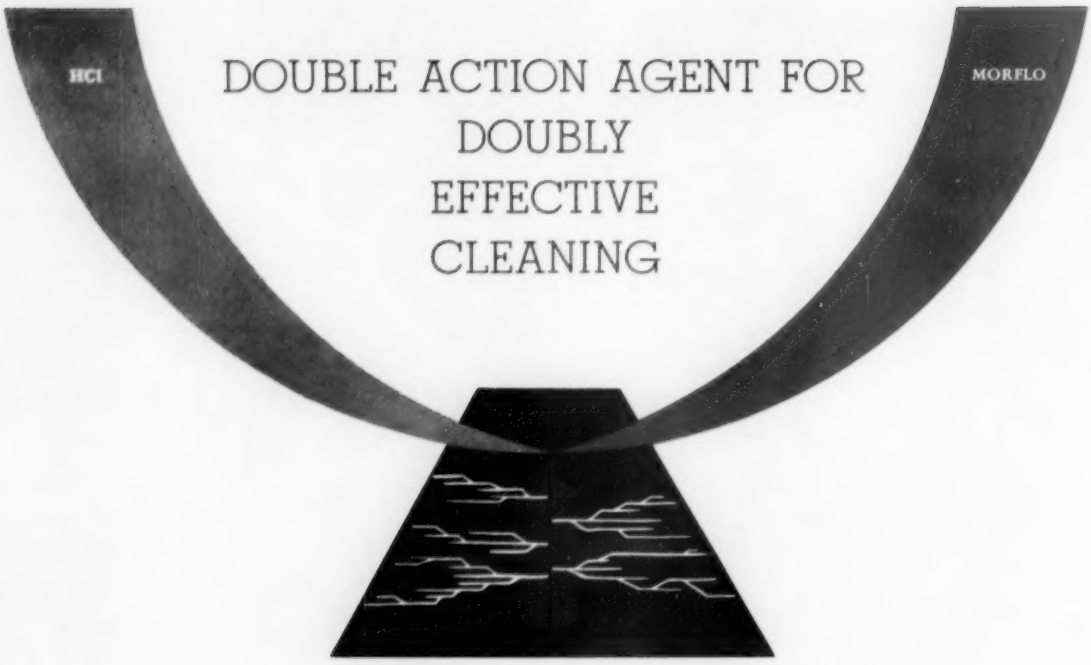

DOUBLE ACTION AGENT FOR DOUBLY EFFECTIVE CLEANING

HALLIBURTON'S MCA

The double action effectiveness of Halliburton's Mud Cleanout Agent has opened the way to increased production on thousands of wells clogged by water blocks, oil-water emulsions and deposition of mud or detritus. MCA's ability to break these blocks, shrink bentonite and disperse muds helps restore original permeability to old or new wells—opening the way to increased oil flow and more profitable production.

MCA is an exclusive compound that combines the power of hydrochloric acid and Morflo, the highly active surfactant developed by Halliburton. With this double power, MCA helps remove all the common barriers to free flow into the well bore—and does it twice as effectively as HCl alone!

Extensive tests showed that treatment with dilute HCl could increase oil flow 300% in sands that had a 10% bentonite content. The same sands, when treated with the double action of MCA, increased oil flow more than 660%. HCl, effective only in dissolving the calcareous content of muds and in shrinking bentonitic particles, required Morflo's help to disperse the free water from the bentonite and destroy water blocks and water-oil emulsions.

The same spectacular increases in oil flow have been demonstrated in the field where double action MCA does the *complete* job of helping restore original permeability by breaking blocks, releasing water, dispersing solids and separating clogging materials for easy removal.

Only MCA has proved its double action in both sand and limestone formations of old and new wells. And only Halliburton has MCA. Specify effective, economical and easy-to-use MCA by calling your local or district Halliburton office. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

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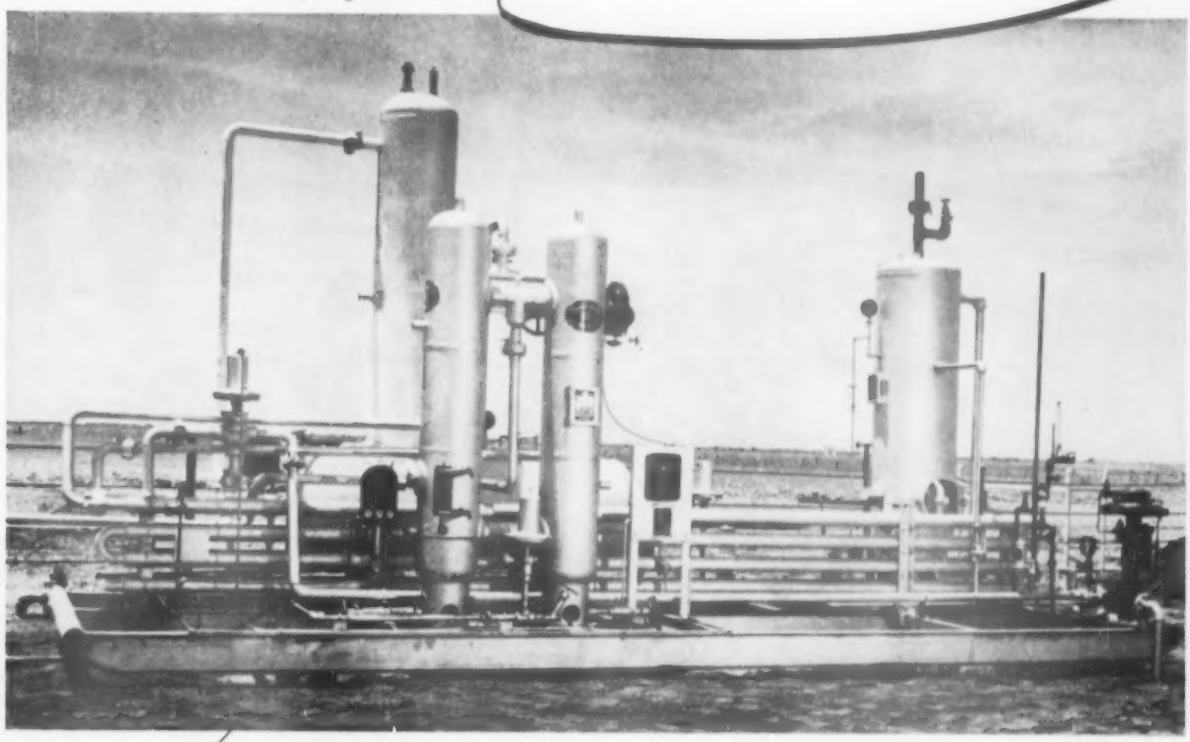
When it comes to COLD separation...



* Parkersburg 6000 lb. 10MMCF Hyreco with Twin Vertical Liquid Knockout.

come to PARKERSBURG

Leader in cold separation, Parkersburg is unsurpassed in experience, both in years and service.

Realizing that various fields and wells have their own factors which determine the efficiency of cold separation, Parkersburg "custom-builds" the Hyreco Gas Processing Unit required to meet those conditions. Parkersburg engineering skill and technical "know-how" combine the standard elements of Hyreco into the one assembly that delivers maximum performance on your well.

There is no compromise with performance when you specify a Hyreco Gas Processing Unit. See your Parkersburg Representative for individually engineered Hyreco installations for your wells.

PESA

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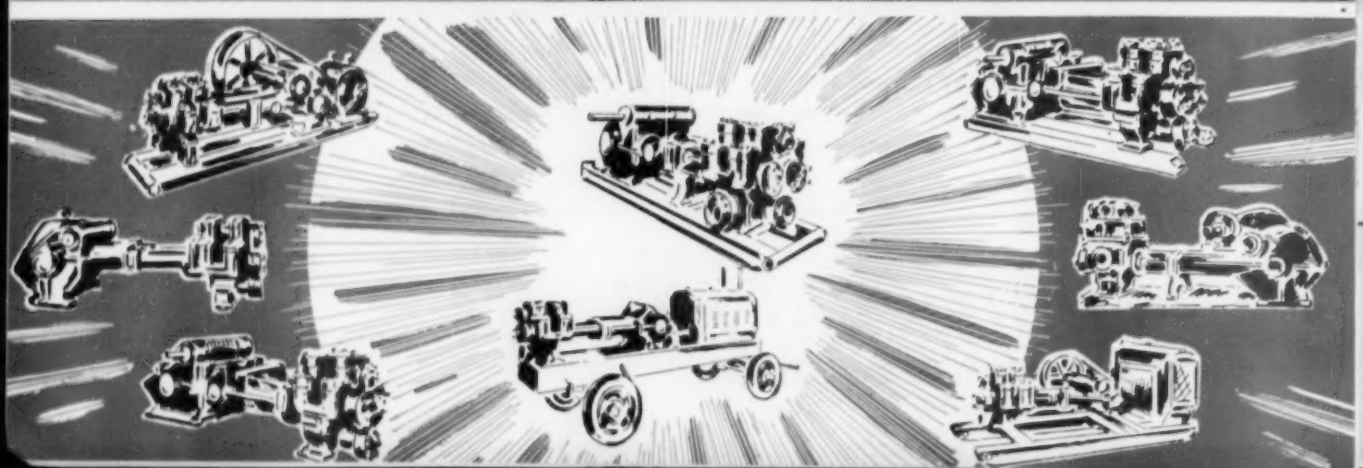
for every oil industry need



Here's my new warehouse at ODESSA, TEXAS

Along U. S. 80, wherever this Highway of America threads thru the oil fields of the nation, you'll find J&L stores, offices, and salesmen.

At Odessa, Texas, the J&L store has moved ten blocks west on highway 80 to an address with more elbowroom, known locally as 1509 West Second Street.

The main building, one of the finest in West Texas, has a vast expanse of unobstructed floor space served by traveling cranes. A steel warehouse, a concrete loading dock, and a private railroad spur complete the arrangements for improved service and expanded inventories.

"... here's MY warehouse!" is a customer attitude for which J&L has profound respect.

J&L STEEL

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STEEL CORPORATION
SUPPLY DIVISION – TULSA, OKLAHOMA
Serving The United States and Canada

On how many chill winter days have you wished for a few hours recreation in the warm sun?

On how many short weekends have you yearned for a few hours of relaxation away from it all?

The warm sun is only hours away

For thousands of busy men, ownership of a BEECHCRAFT has provided a new and better way of living. You travel where and when you want to go – on your own schedules – at your own convenience.

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Beechcraft

Beech Aircraft Corporation, Wichita, Kansas, U. S. A.

BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

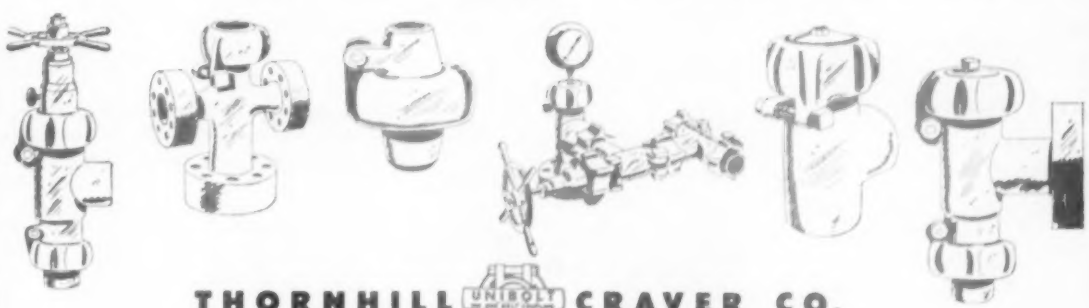
This stem seat of plain carbon steel, removed from an Adjustable Wing Valve after only 45 days of service on a gas-condensate well, graphically illustrates the seriousness of corrosion.

After 7 years of continuous service on the same well, this stem seat of UNIBOLT "SA" Stainless Steel shows little, if any, harmful effect of the gas-condensate corrosion.

If CORROSION is your problem

UNIBOLT "SA" Stainless Steel Christmas Tree Fittings may provide the answer. For the past seven years, in cooperation with a major oil company, UNIBOLT engineers have experimented with various stainless alloys to determine the one most resistant to gas-condensate corrosion. The un-retouched photographs above of identical parts tested on the same well clearly indicate the wisdom of selecting UNIBOLT "SA" Stainless Steel Fittings for corrosive conditions.

UNIBOLT "SA" STAINLESS*



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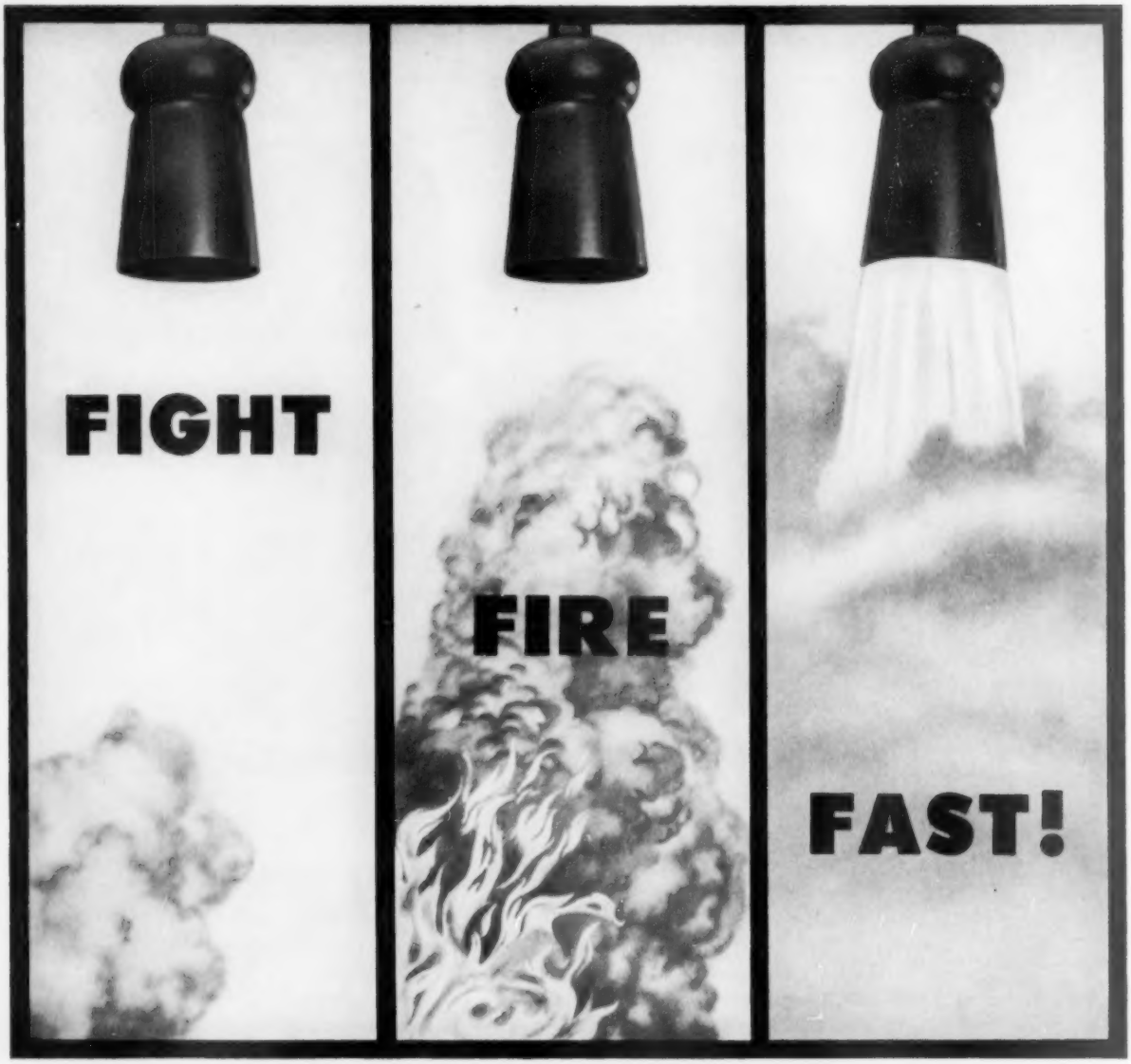

WITH A KIDDE CO_2 SYSTEM!

Let fire get a foothold, and a going concern is *gone*. Don't risk it. Install a Kidde Automatic CO_2 Fire Extinguishing System, and fire won't stand a chance.

A Kidde System goes into action at the first sign of fire—releases clouds of CO_2 over the blaze, smothers fire almost as soon as it starts. And CO_2 leaves no mess to clean up later. It puts out the fire, then vanishes.

Protect flammable liquids, machinery and electrical equipment with a Kidde System.

And for on-the-spot protection, get Kidde portables. When fire strikes, just aim the horn, pull the trigger, and *swoosh!* No more fire.

Don't wait 'til your business is a cinder pile—Contact Kidde today.

Kidde

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Walter Kidde & Company of Canada, Ltd., Montreal—Toronto

3 grades of Aerocat® FLUID CRACKING CATALYST

for better fluidizing, circulating and attrition characteristics

in any fluid cracking unit

The importance of particle size distribution in catalyst efficiency is reflected in the names and performance of Cyanamid's three new grades of AEROCAT.

Following extensive research into existing fluid cracking unit needs, these grades were developed to cover the entire range of requirements. Now you can readily select the grade best suited to your unit operation and secure a higher degree of catalyst utilization through proper fluidization, circulation and reduced attrition. These grades represent a wide range, identified for your convenience by their Particle Distribution Index.

This is another advance in catalyst development that makes AEROCAT your most economical means to

- high octane yields
- high throughput
- low CO_2/CO ratio in flue gas
- high isobutane yield
- excellent heat, steam and sulfur stability

– all good reasons why 8 out of 10 users of synthetic catalyst specify AEROCAT Fluid Cracking Catalyst.

For details, write for a new technical data sheet "AEROCAT–Particle Size Distribution," or discuss your needs with our Technical Representative.

DESIGNED TO MEET ALL FLUID UNIT NEEDS

Aerocat 50/60 (Light) — for fluid units with low linear gas velocities, adequate dust disengaging space, excellent cyclone and Cottrell efficiency, low bed density needs.

Aerocat 60/70 (Intermediate) — for fluid units with moderate to high linear gas velocities, adequate catalyst recovery equipment.

Aerocat 75/85 (Narrow) — for fluid units with high linear gas velocities, moderate disengaging space, limited recovery equipment.

AMERICAN Cyanamid COMPANY

REFINERY CHEMICALS DEPARTMENT

30 Rockefeller Plaza, New York 20, N. Y.

In Canada: North American Cyanamid Limited, Toronto and Montreal

Why more LINK-BELT API (SS type) chain is used than any other brand

CADMIUM-PLATED PINS

The finish on these pins prevents rust, avoids corrosive fatigue in these flexing members. Link-Belt chain pins go into service in factory-finish condition no matter how long they've been stored.

It's built and packaged for the toughest jobs. And it's available at leading supply stores . . . everywhere!

YES — from every angle — Link-Belt's API chain (SS type) leads the field. Starting in with the manufacture, Link-Belt takes extra steps to assure longer chain life. And these "extras"—like the ones shown here—are *standard* on every length of Link-Belt API.

In packaging, too, Link-Belt gives you more value. Steel-banded *double* box keeps out even the finest sand . . . stands up in the wettest weather without wilting.

As for availability, you'll find Link-Belt chain at leading supply stores in your field. And Link-Belt warehouses back them up to serve drillers promptly . . . *everywhere.*

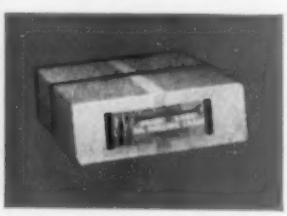
Book 2580 gives complete information on Link-Belt's quality equipment for the oil fields. Ask for a copy today.

FOUR OF MANY "EXTRAS" YOU GET AS STANDARD ON LINK-BELT API CHAIN

GRINDING pins *and* bushings (inside and out) to a fine micro-inch finish eliminates wear-producing surface irregularities.

SHOT-PEENED rollers have been hammered by tiny steel balls—creating added ability to withstand shock and impact.

COTTERS have patented grooved shank affording tight fit in pin hole. Yet pin is easily removed or inserted. Cadmium plated.



MORE CONVENIENT, TOO! Link-Belt packs its oil field chain in dustproof, sturdy boxes for easy handling, quick identification.

LINK-BELT

CHAINS and SPROCKETS

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Los Angeles 33, Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields.

13,540

THIS 400,000 Pounds per HOUR

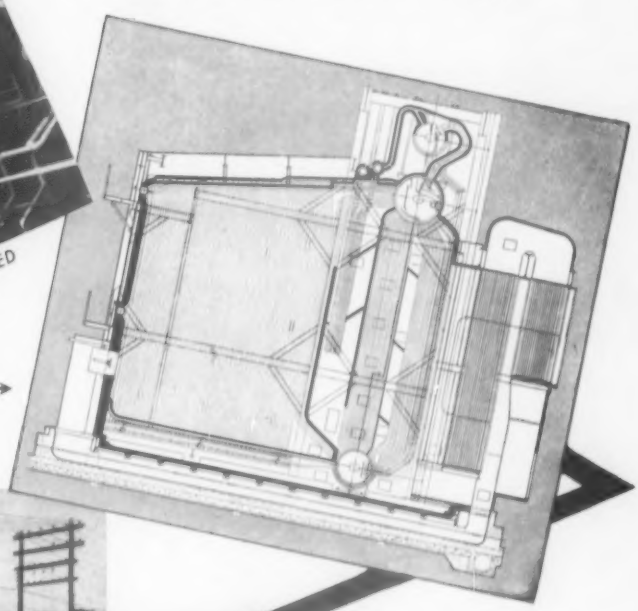
Vogt

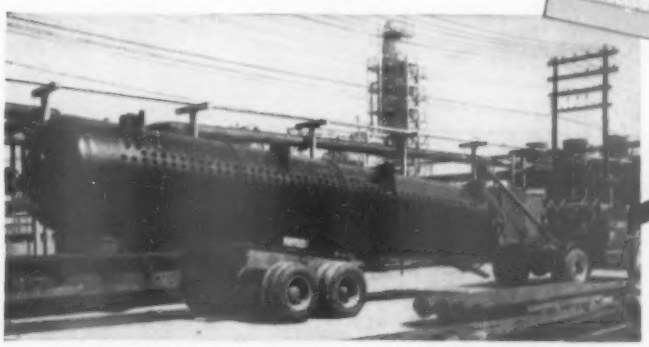
STEAM GENERATOR

Gives Top Performance in a Leading Texas Petroleum Refinery

VIEW OF THE COMPLETED STEAM GENERATOR

RIGHT →
LONGITUDINAL SECTION THROUGH THE UNIT.





6'-6" DIAMETER x 37'-0" LONG STEAM DRUM BEING TRANSPORTED TO THE ERECTION SITE DURING INSTALLATION.

PRINCIPAL DATA

400,000 pounds per hour capacity.

Fusion welded steam and water drums designed for 700 lbs. S.W.P.

Superheater delivers steam at 750°F. total temperature.

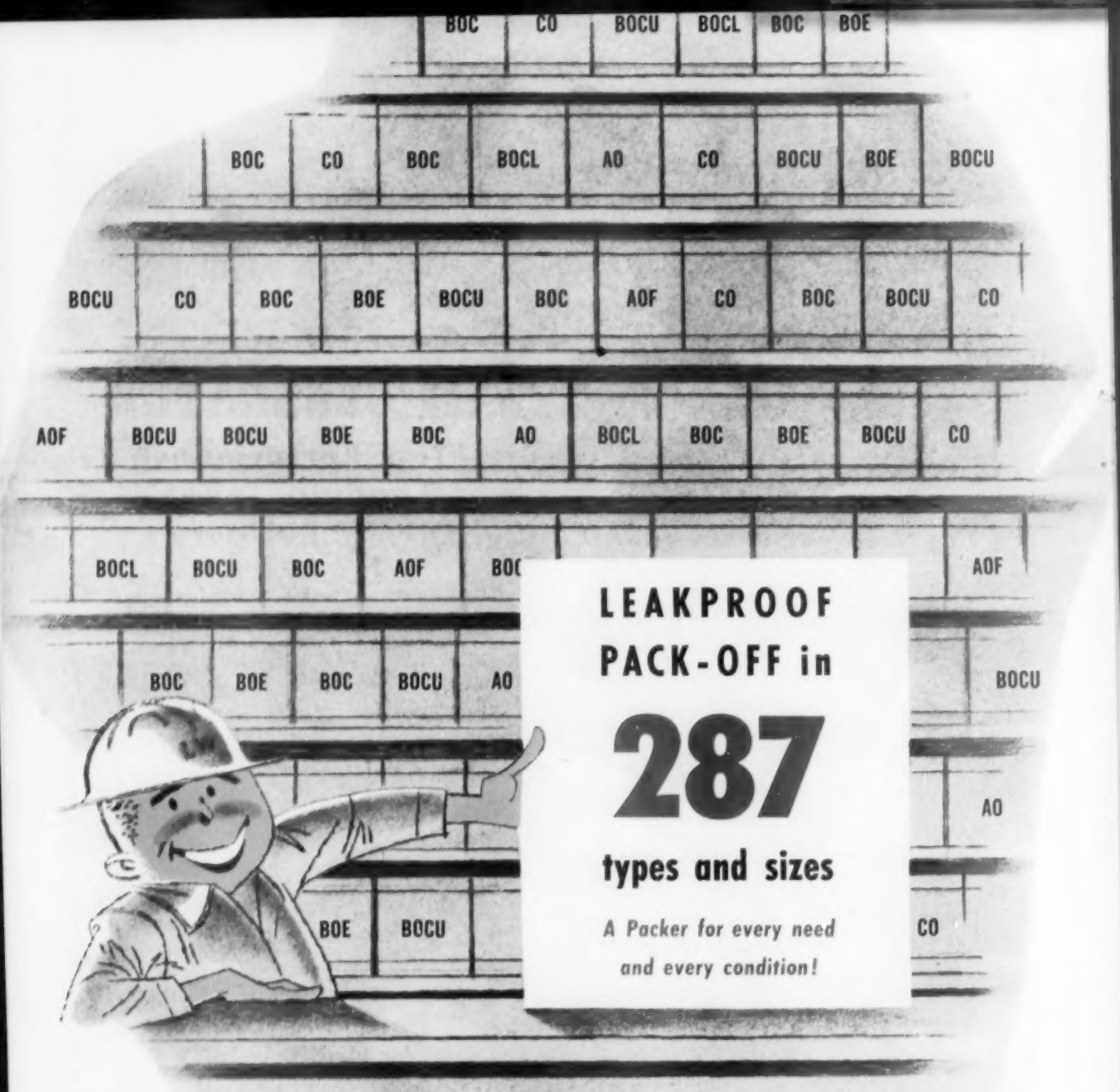
Water cooled furnace.

Burners for Oil and Acid Sludge fuel.

Vogt builds a complete line of bent tube steam generators designed to burn solid, liquid, or gaseous fuels to meet specific operating conditions. Write for bulletins.

HENRY VOGT MACHINE CO., LOUISVILLE 10, KY.

BRANCH OFFICES: New York, Philadelphia, Chicago, Cleveland, St. Louis, Dallas, Charleston, W. Va.


BOC CO BOCU BOCL BOC BOE
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PACK-OFF in
287
types and sizes
A Packer for every need
and every condition!

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LANE WELLS COMPANY®

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PZ-83-A

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when drilling muds began...

Peter Sweeney learned about drilling fluids in 1866 when he patented his Improved Rotary Rock Boring Machine. Down its hollow drill stem he sent "a current of compressed air, steam, or water" to aid in lifting cuttings.

Compare Sweeney's hand-cranked rig and watery fluid to the powerful equipment and dependable muds used today. Baroid men organized the first mud company. In laboratory and field they transformed primitive mud practices into a science. The terminology, materials, and specifications introduced by Baroid are now industry standards.

Remember the well you drilled 20 years ago? If you needed mud you asked for Baroid. Wise executives and engineers still specify Baroid products for every mud problem.

BAROID

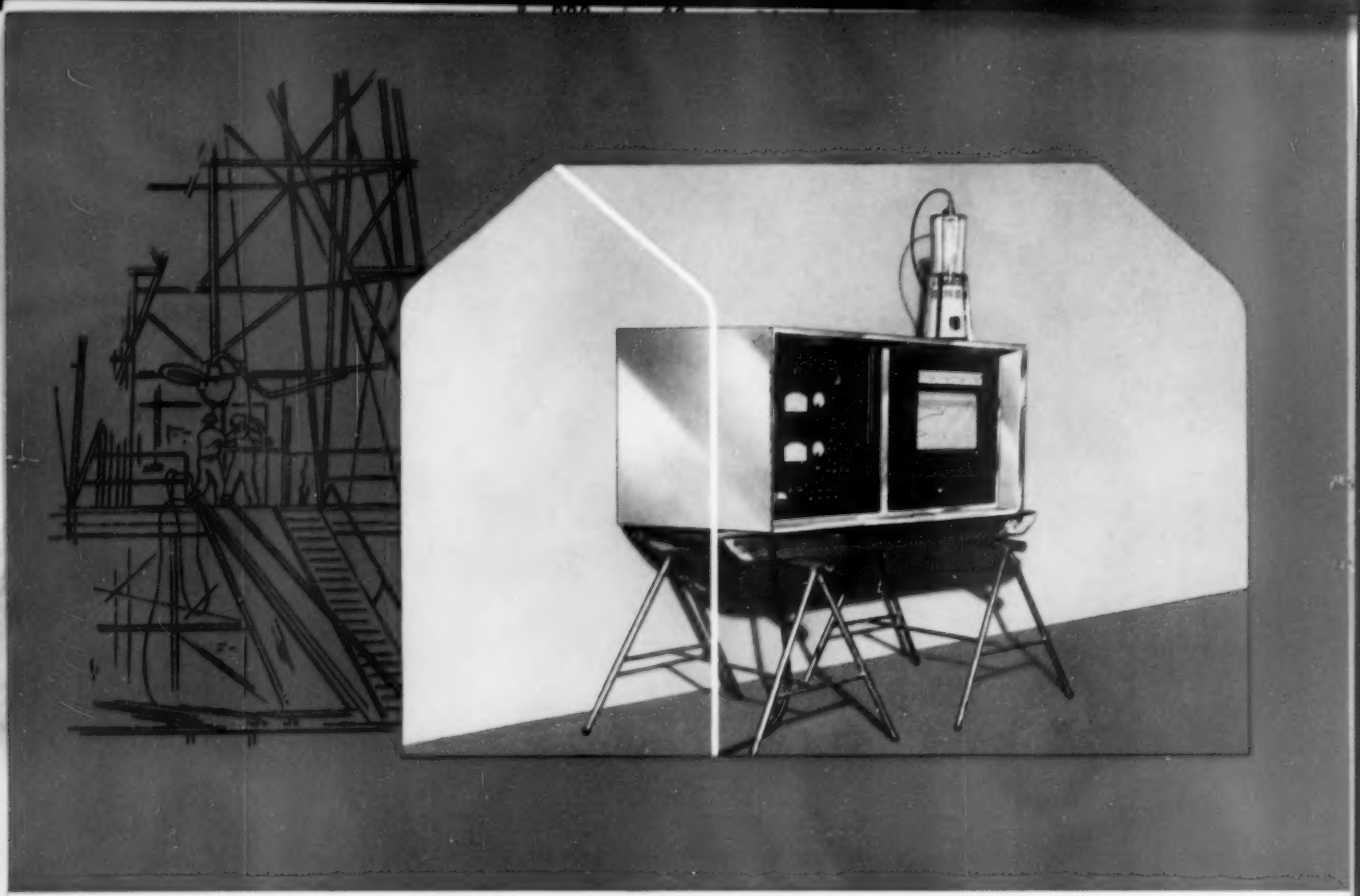
BAROID

Baroid Division

National Lead Company

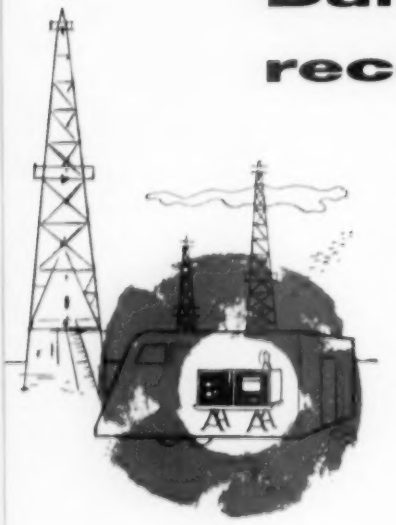
MAIN OFFICE: P. O. BOX 1675 • HOUSTON 1, TEXAS

5008



8009

Baroid's new automatic recording gas detector



Portable, easy to use at any well location.
Your own geologist can make low-cost tests.

Now field-tested and available to you: a portable recording gas detector incorporating the principles made famous by Baroid's mud and cuttings analysis Well Logging Service. Your own field geologist can use it at any well to determine coring points, help interpret electrical logs, pinpoint zones to perforate or DST, and to warn against possible blowouts.

Use it at field wells, isolated or offshore wells, or wherever use of the truck-mounted Baroid Well Logging Service is not justified economically. Use it to continuously, automatically detect and record gas zones penetrated by the bit, or use it for gas determination of batches of cuttings samples.

Readily installed at well site or in geologist's field trailer or sample house. Size is only 4' by 2' by 1½'; weighs 350 lbs., uses only 300 watts of 115 volt power, AC or DC. Write today for brochure giving full details and prices.

BAROID P. O. Box 1675, Houston 1, Texas
Please send me complete information on the Baroid Automatic Recording Gas Detector.

Name ..... Title .....
Company .....
Address .....
City ..... Zone ..... State .....

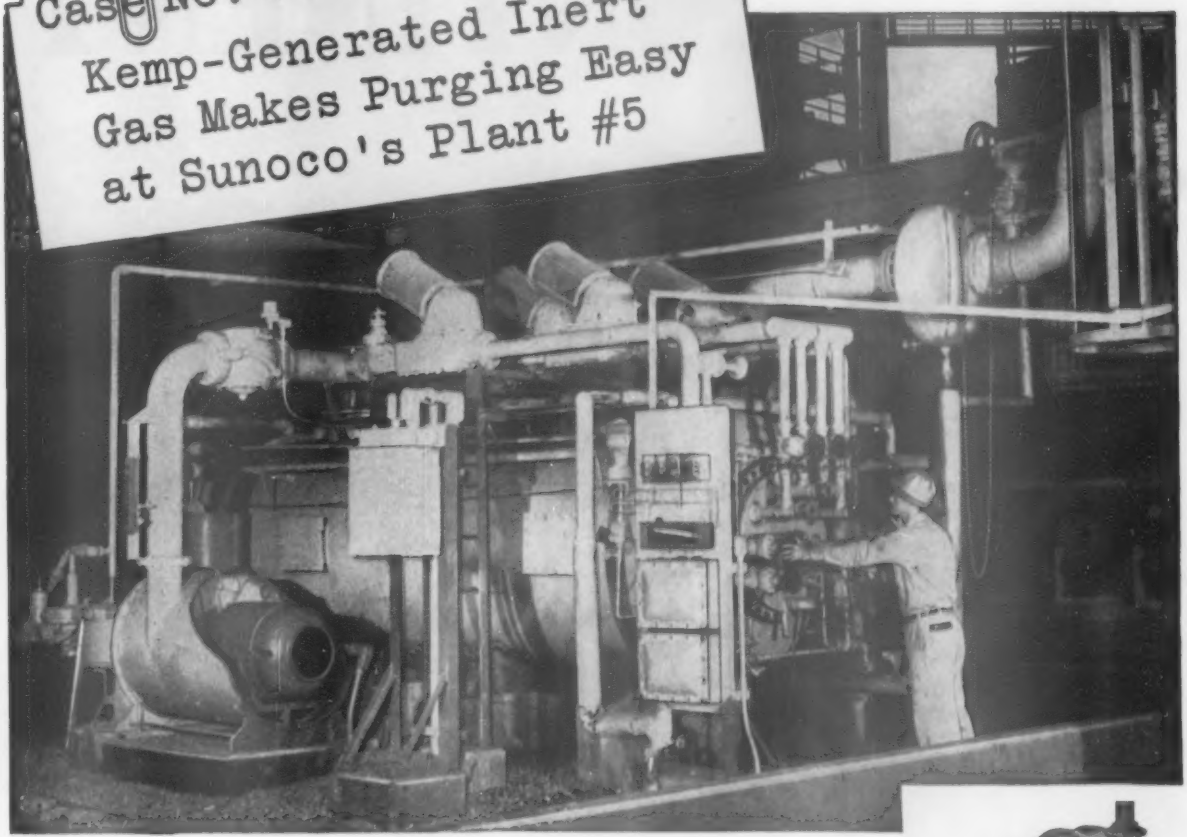
Baroid

BAROID WELL LOGGING SERVICE

BAROID SALES DIVISION • NATIONAL LEAD COMPANY
Main Office: P. O. Box 1675, Houston 1, Texas

Case No. 57

Kemp-Generated Inert Gas Makes Purging Easy at Sunoco's Plant #5



How Sun Oil's "Magic Mill" at Toledo operates with 'round the clock safety

There's no *one* word that strikes terror in the hearts of oilmen everywhere more quickly than F-I-R-E! To combat this threat at the Sun Oil Co.'s giant refinery at Toledo, Ohio, constant vigilance, checks and inspections are the answer. And the liberal use of inert gas for purging pipelines, tanks and crackers is essential to this safety maintenance.

Kemp selected to do the job

When plans called for *doubling* plant production in 1950, a new Kemp Generator (see above) was installed to insure adequate inert gas production. Fast-starting, easy-to-operate, this Kemp unit more than filled the bill. Today tanks and lines are periodically purged for inspection and cleaning *as often as needed*. And thanks to its 60,000 cu. ft. per hr. Kemp Inert Gas Generator, Sunoco enjoys *exact analysis* inert production that meets all its purging requirements.

Let Kemp help you, too

If you have a purging or blanketing problem, why not let Kemp Engineers give you the same helpful advice used so profitably at Sun Oil's Toledo refinery. It costs you nothing to investigate. And it may save you money. Find out how Kemp's wide range of dependable, low-cost Generators (complete with the latest fire checks and safety devices) offer you the best way to solve your problems.

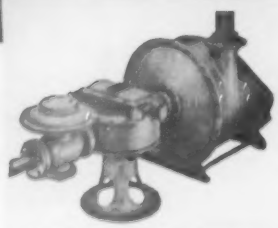
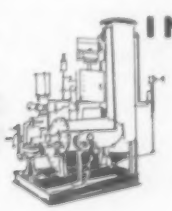


Photo above shows close-up view of Kemp Industrial Carburetor, the heart of every Kemp installation. Assures complete combustion... without waste, without tinkering. Reduces installation costs, simplifies maintenance.

For more complete facts and technical information, write for Bulletin I-10 to: **C. M. KEMP MFG. CO., 405 E. Oliver Street, Baltimore 2, Maryland.**

KEMP OF BALTIMORE



INERT GAS GENERATORS

CARBURETORS • BURNERS • FIRE CHECKS METAL MELTING UNITS • ADSORPTIVE DRYERS • SINGEING EQUIPMENT

MID★CONTINENT

Locates

...ANOTHER NEW SUPPLY STORE IN

CANADA

at DRAYTON VALLEY, Alberta

Expanding in Canada to meet the needs of Canada's fast-growing Oil Industry

ABOVE—New fully stocked Supply Store at Drayton Valley, Alberta.

RIGHT—Modern Supply Store and District Offices at Edmonton, Alberta

Mid-Continent in Canada

CALGARY—Division Offices
EDMONTON—District Offices and Supply Store
DRAYTON VALLEY—Supply Store
RED DEER—Sales Office

MID-CONTINENT Supply Company

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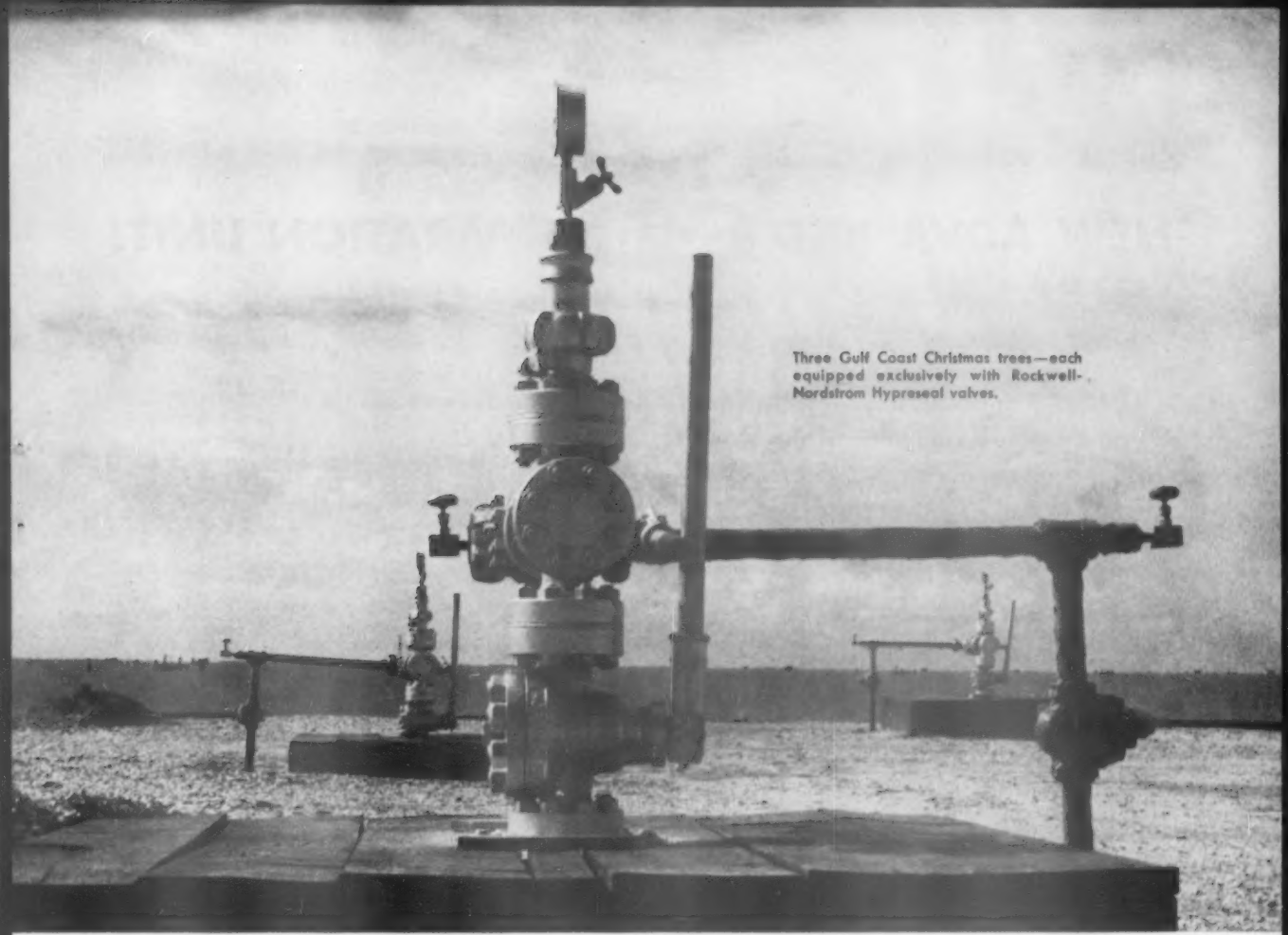
THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY



Three Gulf Coast Christmas trees—each equipped exclusively with Rockwell-Nordstrom Hypreseal valves.

A COMMON SIGHT on the Gulf Coast . . .

ROCKWELL-Nordstrom Equipped Christmas Trees

In the oil-rich Gulf Coast area you often see groups of Christmas trees—*all* equipped with Rockwell-Nordstrom valves.

It's no accident that this valve is installed on so many Christmas trees. Rockwell-Nordstrom valves surpass any other type in resistance to wear and corrosion, prevention of leakage, and safe, dependable operation. These three features are of vital importance in wellhead control.

There is a new bulletin, *Trees of Steel*, which describes Rockwell-Nordstrom valves for Christmas tree service. Write for your copy today to Rockwell Manufacturing Company, Pittsburgh 8, Pa.

Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-Nordstrom VALVES

Lubricant-Sealed for Positive Shut-Off

Why is Dunham Tanks forging ahead?

(NO. 1 IN A SERIES OF 10 ADS.)

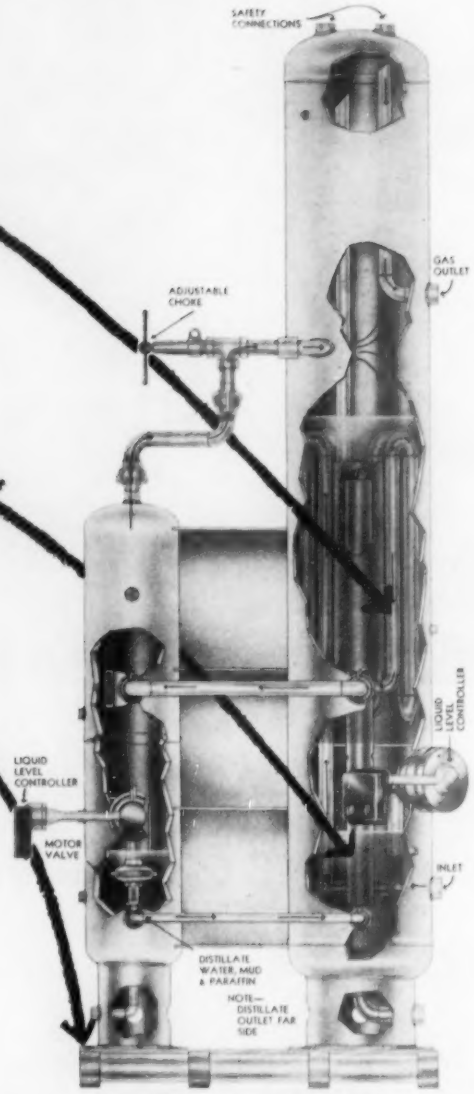
NEW ADVANCED COLD SEPARATION UNIT!

better because . . .

no freezeups due to constant liquid bath even if liquid valve cuts out or liquid control fails . .

no freezeups can be caused by mud or paraffin. Solids are directed to lower compartment away from coil . . .

simple installation — unit is skid mounted with all piping in place minimizing field erection costs



DUNHAM 5 MMCFT TYPE CSUV
COLD SEPARATION UNIT

Products:

Welded and Bolted Steel Tanks, Steel Stairways and Walkways, Vertical and Horizontal Oil & Gas Separators, Emulsion Heaters and Treaters, Indirect Gas Heaters, Cold Separation Units, Two Stage Separation Units, Gas Dehydration Units, Three Phase Separators, Free Water Knockout, Servel Refrigeration Units and LeRoi Compression Units.

ANDERSON-DUNHAM, INC. DUNHAM TANKS TANK DIVISION

DUNHAM TANKS

Division of Anderson-Dunham, Inc., Baton Rouge, La.

Offices and Stocking Points: Shreveport, La.; Lafayette, La.; Kilgore, Tex.; Seminole, Okla.; Perry, Okla.; Corpus Christi, Tex. (Lester Moore Tank & Supply Co.); New Orleans, La.

THERE'S AN

EXTRA DIVIDEND IN

STEEL PIPE!

There are plenty of good reasons why you get top-quality pipe when you buy SPANG CW for oil country use. But the very careful steps used to test and inspect SPANG CW Pipe prior to shipping give you an "extra dividend" that pays off in top-quality installations for water systems, air lines, gas lines, water flooding lines, oil gathering systems and salt water disposal lines. Here's what we mean:

TESTING. Each length of SPANG Pipe is subjected to a hydrostatic test, the final check to make sure the weld is sound. Test pressures applied are well above actual requirements.

INSPECTION. Threads and couplings are gauged and measured for length, pitch and quality. Each length of pipe is inspected visually inside and out with the aid of light from fluorescent tubes to be positive that it meets SPANG's high product requirements.

To these two factors add quality steel, automatically controlled furnaces, and the latest developments in mechanized production. Result: consistently good quality pipe, built to stand up under the roughest oil country treatment.

Why just buy any pipe when you can get top-quality SPANG Pipe at no extra cost? Your nearby National Supply Store carries SPANG CW Steel Pipe in a full range of sizes. Take advantage of the "extra dividend" that Spang CW offers you.

NATIONAL BLUE PRODUCTS

SPANG-CHALFANT DIVISION

THE NATIONAL SUPPLY COMPANY

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NATIONAL OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE • SUPERIOR & ATLAS ENGINES

NICHOLSON TRAPS

for every plant application

Send for Nicholson catalog 953. This 32-page standard reference on advance-type trapping of steam, air and other mediums contains: installation diagrams, charts for determining trap sizes, and advice on specific problems. See why leading plants are increasingly standardizing on Nicholson traps for increased production and minimum maintenance: thermostatic (illustrated) and metal expansion for pressures to 250 lbs.; weight and piston-operated, to 1500 lbs.

Send for Helpful Booklet

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

210 Oregon Street, Wilkes-Barre, Pa.

STOP *Vapor Losses*

with OCECO "Type B" VENT UNITS

● Combined flame arrestor and conservation vent valve. These units protect both the tank and tank contents from entrance of flame; control and restrict tank breathing and prevent the free escape of vaporized liquids and lowering of gravity ratings. Sturdy, dependable, efficient and trouble-free Oceco construction. 2" to 10" sizes. *Write for Catalog 474-R. It gives full details.*

OCECO TANK FITTINGS

THE JOHNSTON & JENNINGS CO.

division of PETTIBONE MULLIKEN CORP.

4751 West Division St. • Chicago 51, Illinois

They Say—

The I.P.A.A.'s Plan

"You may count upon certain politicians and half-baked economic theorists to set up fresh howls over a proposal by the Independent Petroleum Association of America . . .

"A committee of President Eisenhower's cabinet asked some time ago what is the best way to make certain that we will continue to find enough more gas and oil in this country. The independents come up with this answer: Increase the depletion allowance . . .

"It is not reasonable to expect, in view of the misunderstanding on the part of so many folks in and out of Congress, that this request for an increase in allowances will meet with ready acceptance. But it should have a tactical value in resisting the move to abolish present allowances. That is as much, perhaps, as the independents could hope for at this time."

Editorial in the Dallas Morning News.

Canadian Review

"The importance of the long-term view has become clearer in the last year or so. In the early years of Canada's oil industry, it didn't seem so important, and the phenomenally rapid growth resulted in burst of optimism by speculators, operators, and citizens generally. But today the early unrealistic golden dreams have been replaced by mature, economic appraisal and constructive planning . . .

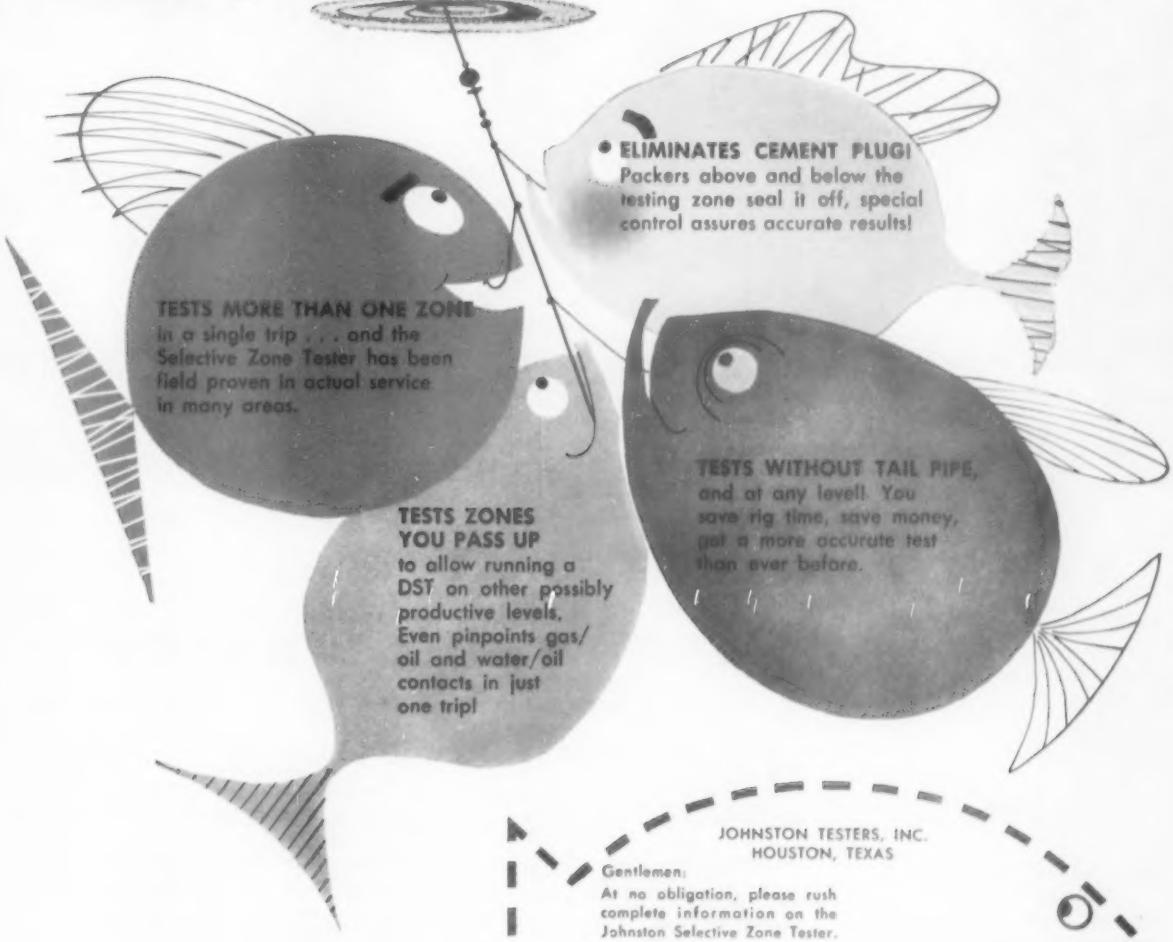
". . . The biggest find (in Canada) recently was the discovery of the fabulous Pembina field 70 miles southwest of Edmonton . . . Pembina, together with the Sturgeon Lake discovery 175 miles northwest of Edmonton, has indicated the existence of big fields well beyod the area where previous major discoveries have been made . . .

"As important additional assets, there are the Athabasca tar sands in Alberta, a vast reservoir reported to exceed the known world reserves of petroleum. To date those sands have defied any economical process for extracting oil, but research continues, and eventually some commercial method will be found to remove the treasure . . .

". . . It is cheaper to bring Middle East oil to the U. S. west coast in low-tariff tankers than it is to supply those big markets entirely from Alberta crude via Trans Mountain pipeline. If and when tanker rates go up, this could

JOHNSTON SELECTIVE ZONE TESTER

gives you all four with only one trip in the hole



TESTS MORE THAN ONE ZONE in a single trip . . . and the Selective Zone Tester has been field proven in actual service in many areas.

• **ELIMINATES CEMENT PLUGS!** Packers above and below the testing zone seal it off, special control assures accurate results!

TESTS ZONES YOU PASS UP to allow running a DST on other possibly productive levels. Even pinpoints gas/oil and water/oil contacts in just one trip!

TESTS WITHOUT TAIL PIPE, and at any level! You save rig time, save money, get a more accurate test than ever before.

AVAILABLE everywhere
ACCURATE every time

JOHNSTON TESTERS, INC.
HOUSTON, TEXAS

Gentlemen:
At no obligation, please rush complete information on the Johnston Selective Zone Tester.

Name_____
Firm_____
Address_____
City_____ Zone____ State_____

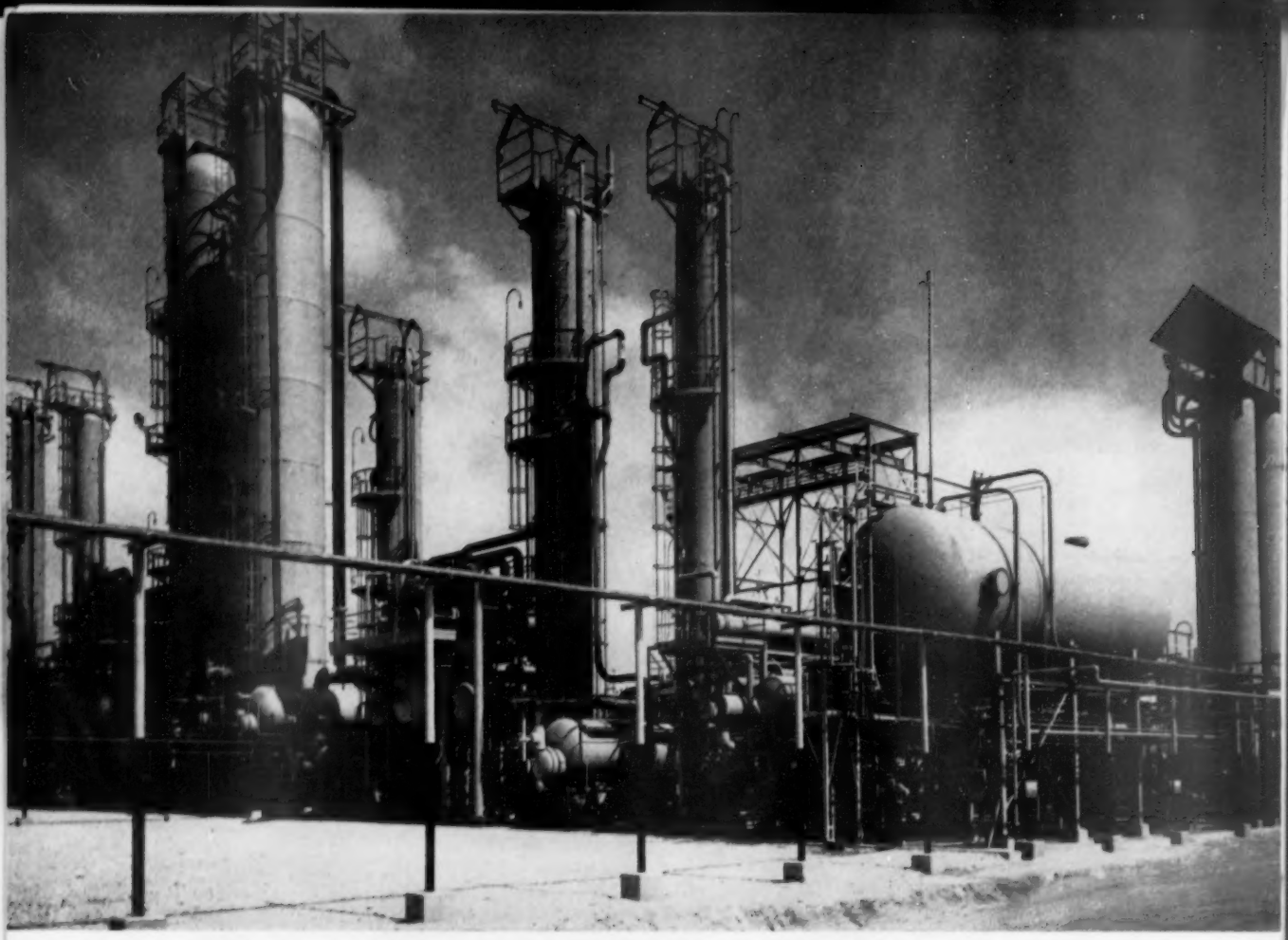
JOHNSTON TESTERS

first in drill stem testing

HOUSTON, TEXAS

LOS ANGELES, CALIF. • CALGARY, CAN.

FORMATION AND CASING TESTING — JOHNSTON



THE REFINERY THAT WAS BOUGHT "SIGHT UNSEEN"

THE owners bought this plant before the plans were on paper. You'll be doing that, too, when you sign a contract for your new plant—and you'll have to be ***sure*** of the qualifications of the firm you hire.

McKee has a long, successful record of sound, practical engineering and construction of projects like yours all over the world. It's the result of accurate analysis and thorough thinking-through of every detail of design, construction and equipment by a well-qualified staff of experienced technical specialists and field personnel.

You can't buy your plant ***after*** it's built, but you ***can*** make sure it will be correctly designed and efficiently constructed when you call in McKee.

McKee Engineering Services

Arthur G. McKee & Company • Engineers and Contractors

Headquarters: McKee Building • 2300 Chester Avenue • Cleveland 1, Ohio
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British Representatives of Metals Division: Head, Wrightson & Co., Limited
Canada: Arthur G. McKee & Company of Canada, Ltd., 372 Bay St., Toronto

change and there might even be some penetration of California by Canadian crude . . .

"The natural-gas industry in western Canada takes an attitude of hopeful anticipation, confident that a great era of important industrial developments will soon be ushered in . . . There is currently some hope that Peace River gas may later supplement the U. S. sources that were commissioned last summer to serve the Pacific Northwest . . ."

Ole Berg, Jr., president, British American Oil Co., Ltd., in an address in Kansas City to the American Petroleum Credit Association.

When Horses Pull Together

"Advancing scientific studies and actual reservoir performance have established beyond question that a reservoir produced as a unit will have a higher yield . . . Nature exerts a harder pull if all her horses are pointed in the same direction . . .

"Without unitization laws the selfish and the careless can pop the gas or spoil the crop without regard to their neighbor's rights . . .

"A few disgruntled individualists remain, but most of them are a happy lot. They like saving oil for the public benefit, and incidentally making a few extra bucks for themselves."

T. Murray Robinson, Oklahoma City attorney and member of the Interstate Oil Compact Commission's legal committee, in an address to the Los Angeles Basin chapter of the American Petroleum Institute.

Delaying Natural Gas

"It is over a year now since the momentous decision was made to bring western (Canadian) natural gas directly into the great consuming areas of central Canada (by the Trans-Canada pipeline). And still not one contract has been signed with eastern distributors. . .

"No one agency can be held responsible for all this costly and extremely dangerous delay. This is a cooperative venture which concerns equally western producers, pipeline carriers, eastern distributors, and both the Canadian and U. S. federal authorities.

"It is high time that all these parties, or at least the Canadian group, got their feet under one table and reached some definite agreements. There have been months of talking and explaining. What we need now is action. This is an important new Canadian utility whose building will have a profound national effect."

Editorial in the Financial Post.

HENRY H. PARIS DISTRIBUTOR Inc.

Manufacturer's Agent - Oil Well and Refinery Supplies

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Agent and Distributor for the following Nationally Known Manufacturers:

ALTEN FOUNDRY & MACHINE WORKS
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Pumping Units, Jacks & Surface Equipment.

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OIC Valves, Bronze, Iron, Cast and Forged Steel for all purposes.

DRESSER MANUFACTURING DIV.
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Seamless Welding Fittings.

OIL STATES EQUIPMENT COMPANY
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THE GORMAN-RUPP COMPANY
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Centrifugal Pumps.

STEEL FORGINGS, INC.
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Weld Saddles.

HARRISBURG STEEL CORPORATION
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Forged Steel Flanges and Seamless Casing Couplings.

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Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

LOS ANGELES BOILER WORKS
Los Angeles, California
Welding Caps—Dished & Flanged Heads.

WESTERN SAFETY BARREL STAND
Houston, Texas
Stand lifts, holds, tilts 55 gal. barrels Prevents spillage—easily loaded.

MILLS IRON WORKS, INC.
Los Angeles, Calif.
Seamless Swage Nipples, Bull Plugs & Welding Reducers.

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS.

Meets A.P.I.* Standards for CUSTODY TRANSFER SERVICE

* American Petroleum Institute

"Varec"

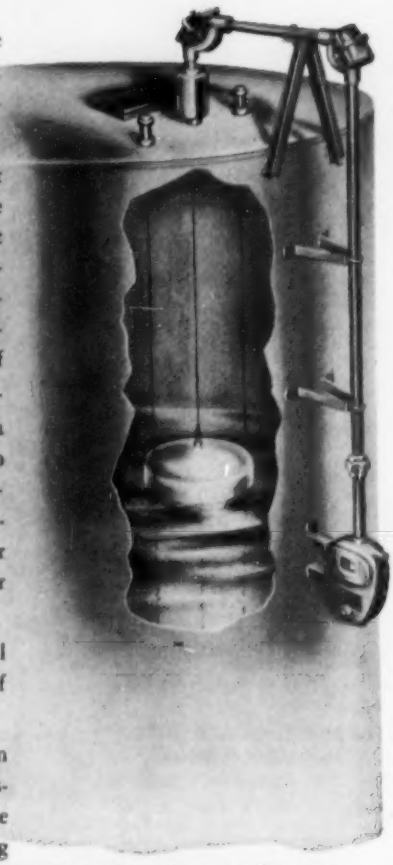
AUTOMATIC TANK GAUGE

PATENT NO. 1879805, OTHER PATENTS PENDING

Float and Neg'ator motor actuated — ground reading — automatic tank gauge.

It is gastight and will handle working pressures to 15 p.s.i.g. Equipped with gravity compensator and operation checker.

A feature of this gauge is that it is provided with special pipe brackets to insure alignment and a synthetic rubber expansion joint, which allows 2" vertical movement and ½" horizontal movement of tank roof without stress on tape piping.



Where corrosive vapors are a problem, a liquid seal unit to protect working parts is obtainable at extra cost. Standard liquid seal 8½" H_2O pressure or vacuum. Available for higher pressures upon special order.

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CALENDAR

NOVEMBER

28-Dec. 3 American Society of Mechanical Engineers, Statler Hotel, New York.

DECEMBER

2-4 Interstate Oil Compact Commission, winter meeting, Drake Hotel, Chicago.

2-4 American Chemical Society, Southwest Regional meeting, Fort Worth, Tex.

3 Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo, Tex.

12-15 American Institute of Chemical Engineers, annual meeting, Statler Hotel, New York.

30 Industrial Science Secton, American Association for Advancement of Science, annual all-day meeting, Hotel Claremont, Berkeley, Calif.

1955

JANUARY

17-18 Kansas Oil Men's Association, annual convention, Baker Hotel, Hutchinson, Kans.

17-19 Pipe Line Contractors Association, annual convention, Hotel Statler, Los Angeles.

26-28 Symposium on instrumentation for process industries, A. & M. College of Texas, College Station, Tex.

27-28 American Chemical Society, symposium on hydrocarbon chemistry, Rice Hotel, Houston.

27-28 Southern California Meter Association, fourth annual instrument short course, Los Angeles Harbor Junior College, Wilmington, Calif.

FEBRUARY

13-17 American Institute of Mining and Metallurgical Engineers, annual meeting, Conrad Hilton Hotel, Chicago.

13-18 A.S.T.M. Committee D-2 on Petroleum Products and Lubricants, Rice Hotel, Houston.

14-16 Rocky Mountain section of A.A.P.G., annual regional convention, Billings, Mont.

16-18 National Association of Corrosion Engineers, sixth annual short course for pipeliners, Mayo Hotel, Tulsa.

25 National Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

MARCH

4 Southern Gas Association, transmission management conference, Shamrock Hotel, Houston.

7-11 National Association of Corrosion Engineers, Palmer House, Chicago.

9-11 American Petroleum Institute, Division of Production, Southwestern spring meeting, Jung Hotel, New Orleans.

17-18 Southern Gas Association, Distribution Management Conference, Jung Hotel, New Orleans.

23-24 Pacific Coast Gas Association, accident prevention conference, Santa Barbara, Calif.

23-25 American Petroleum Institute, Division of Production, Mid-Continent District, Herring Hotel, Amarillo, Tex.

24-25 American Gas Association, gas supply, transmission, and storage conference, Wm. Penn Hotel, Pittsburgh.

27-29 Texas Independent Producers and Royalty Owners Association, ninth annual meeting, Hotel Texas, Fort Worth.

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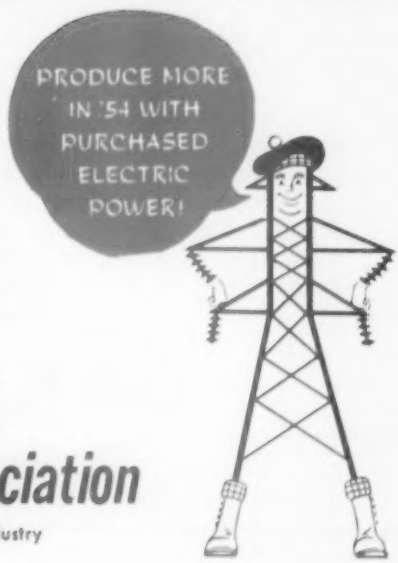

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28-31	American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Exploration Paleontologists and Mineralogists, annual meeting, Hotel Statler, New York.
28-April 1	American Society for Metals, ninth Western Metal Exposition and Congress, Pan-Pacific Auditorium, Los Angeles.

APRIL

13-15	Natural Gasoline Association of America, annual convention, Baker and Adolphus hotels, Dallas.
13-15	American Society of Lubrication Engineers, tenth annual meeting, Hotel Sherman, Chicago.
19-20	Pacific Coast Gas Association, distribution conference, Phoenix.
19-21	Southwestern Gas Measurement Short Course, North Campus, University of Oklahoma, Norman, Okla.
28-29	American Petroleum Institute, Division of Production, spring meeting of Pacific Coast district, Statler Hotel, Los Angeles.

MAY

1-4	Liquefied Petroleum Gas Association, annual convention, Conrad Hilton Hotel, Chicago.
1-4	American Institute of Chemical Engineers, Shamrock Hotel, Houston.
9-10	American Gas Association, Gas Supply, Transmission and Storage Conference, Hotel William Penn, Pittsburgh.
9-12	American Petroleum Institute, Division of Refining, midyear meeting, Jefferson Hotel, St. Louis.
11-12	Pacific Coast Gas Association, gas supply and transmission and conference of technical session, Palm Springs, Calif.
14-22	World Wide Chemical Plant and Equipment Exposition and Congress, Frankfurt Germany.
16-18	American Petroleum Institute, Division of Transportation, products pipeline conference, Edgewater Beach Hotel, Chicago.
16-18	Southern Gas Association, New Orleans.
23-25	American Petroleum Institute, Division of Marketing, midyear meeting, Chase and Park Plaza hotels, St. Louis.
26-27	Kentucky Oil and Gas Association, annual meeting, Lafayette Hotel, Lexington.
30-June 1	Chemical Institute of Canada, thirty-eighth annual conference and exhibition, Quebec City, Que.

JUNE

5-9	Canadian Gas Association, annual meeting, Sheraton-Brock Hotel, Niagara Falls, Ont.
6-10	American Petroleum Institute, Division of Production, midyear committee conference, Brown Palace Hotel, Denver.
6-15	Fourth World Petroleum Congress, Rome, Italy.
9-10	Natural Gas and Petroleum Association of Canada, Royal Connaught Hotel, Hamilton, Ont.
9-10	Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh.
16-18	Interstate Oil Compact Commission, Denver.
28-July 1	American Society for Testing Materials, Chalfonte-Hadden Hall, Atlantic City, N. J.

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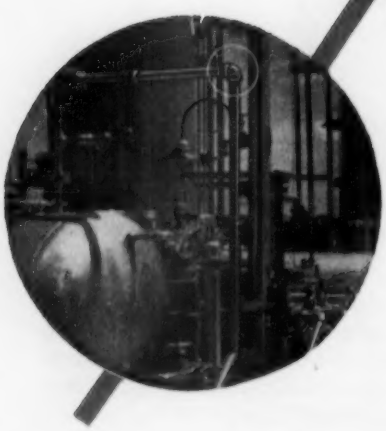

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JOURNAL

TULSA, OKLAHOMA

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JOURNALLY Speaking

Ash Tray Saga

IF there's any business that has more unexpected and inexplicable occurrences than the oil business it's the publishing business. The darndest things keep happening.

The latest is a letter from Mrs. John Christopher, wife of a petroleum engineer in Manhattan Beach, Calif. She wrote:

"Just in case you have been looking for the enclosed, it came to us in the last issue of the Journal between the pages. My husband asked if I would return it to you, with contents intact, as we do not need an additional ash tray."

And, believe it or not, enclosed was a 3½-in. metal ash tray containing two cigaret butts.

Now the gremlins that infest every printing plant sometimes make us print a picture upside down, get an important person's name all balled up, or put the wrong headline on an article. But this is the first time we ever sent an ash tray across the continent at second-class postage rates.

So don't jump to the conclusion that we have started to emulate Cracker-Jack by putting a prize in every package. Our circulation manager has a standard bag of tricks for inducing people to subscribe, and our editors lie awake nights thinking up ways to make all the articles so attractive that subscribers will read every page. But we haven't yet had to resort to a general policy of giving away ash trays (new or used) or similar gimcracks in order to get people to open the Big Yellow Book.

We assigned our own bureau of investigation to the case, and after some detective work worthy of Dick Tracy and Sherlock Holmes we have an explanation.

That ash tray was positively identified as one used by workers on our assembling and binding machine. Obviously it fell off the machine, got mixed up in the printed pages, and was carried on—butts and all—through the rest of the binding and mailing process. Elementary, my dear Watson.

But then the mystery heightens. That binding machine is a complicated mechanical monstrosity that would turn Rube Goldberg green with envy. Long arms deftly pluck "forms" of printed pages from each of 20 or more piles at one time, stack them up in proper order, turn them on edge, shake them into place, and put them on a conveyor belt. Then the pages go to the stapling machine which rams wires through the backbone, another machine pastes on the cover, and the magazine gets flopped over, has its edges trimmed, is stacked by hand, and finally goes through the wrapping machine.

Don't ask us how that ash tray could get in there under the alert eyes of an expert crew, stay there during all the shaking and handling, and miss the staples and the trimming knives without even spilling the ashes. We can't explain it.

We would like to promise that it will never happen again, but we don't dare do that because we would have sworn that it could never happen in the first place. Since it did happen, we'll attempt to cover our wonderment and embarrassment by concluding that this incident proves several things:

1. We have some very careful readers who never miss a thing no matter how well buried in our pages.

2. There's always something worth while in every issue of the Journal, even if you don't happen to need an additional ash tray.

3. Oil men's wives read our favorite oil publication too.

4. Mrs. Christopher is a very honest woman to return property which did not belong to her. (Under the law, you know, unsolicited merchandise received through the mails does not have to be returned.) Thank you, Mrs. C.

5. Those chumps in the bindery crew had better be more careful in the future.

6. Like we said, the darndest things happen in this business.

Henry D. Ralph.

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Here's aspirin for that annual headache

THE oil industry could save itself a quarter-billion dollars and a bushel of headaches every year if it would get wise to the simple fact that demand for its products is bigger in winter than in summer.

The obvious thing to do would be to produce more in the winter than in the summer. But the industry usually does just the opposite.

Crude production continues high well into the summer and then is agonizingly cut back when it is finally realized that stocks are too high. By late winter it becomes apparent that demand has picked up, so production is increased and kept high until into the summer when slackening markets again scare the industry into thinking that everything has gone to pot.

Refinery runs also are prone to follow the same contraseasonal pattern, though with more fluctuations. Of course output can't be geared precisely to seasonal consumption, but it could come a lot closer to it than it has in recent years. There is little sense carrying unnecessarily large inventories of crude and products when the industry has such adequate reserve capacity and flexibility in operations.

REFINERS OUGHT TO TAKE THE LEAD in keeping supply adjusted to demand from season to season. Their runs pattern and the nominations of their crude buyers could eliminate the annual summer complaint of too much oil on the market.

But since refiners don't do it, the producing states should. Prorating bodies should pay more attention to products stocks and to the known pattern of seasonal demand, and place less dependence on crude stocks alone. Crude importers and producers in nonprorating states likewise should supply a little less in summer and a little more in winter.

The dollar gain from tailoring supply to the seasons would be mostly to refiners and marketers through elimination of gasoline price shadings caused by oversupply. But producers wouldn't lose anything by doing their curtailing in the spring instead of the fall.

In fact, producers would gain, because weak products markets endanger the crude-price structure. And once they became accustomed to a seasonal slackoff they would be spared the distress of wondering what happened to demand every summer.

THE INDUSTRY DEPLORES the fact that it can't forecast winter weather. Maybe nothing can be done about that. But it can forecast that demand will be higher in winter than in summer. And it can do something about this.

It's like the farmer who refused to buy a book on better farming "because I ain't farming half as good as I know how already."

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New combination acid-fracture treatment produced 1000 BOPD more than oil-base fracturing job

Frac Acid*, a new type of treatment developed by Dowell, is used to fracture and acidize oil and gas wells—in one operation!

Here's an example of its effectiveness. Three wells completed in a limestone formation offset each other. One produced only 90 BOPD after treatment with a total of 40,000 gallons of regular acid. The second well produced 240 BOPD after a 20,000 gallon oil-base fracturing treatment.

Then Dowell engineers fractured the third well using 15,000 gallons of Frac Acid. As a result of this service, the well produced at the rate of 1248 BOPD!

In Frac Acid treatments the fracturing fluid is inhibited hydrochloric acid thickened to carry suspended sand. Chemical additives like those used in regular acidizing may be incorporated as desired. Wells have cleaned up readily after Frac Acid treatments. No gel-breaker solution or shut-in time is required.

See how Frac Acid can help you achieve more successful well completions. Telephone your nearest Dowell office, or write DOWELL INCORPORATED, Tulsa 1, Oklahoma, Dept. K-11.

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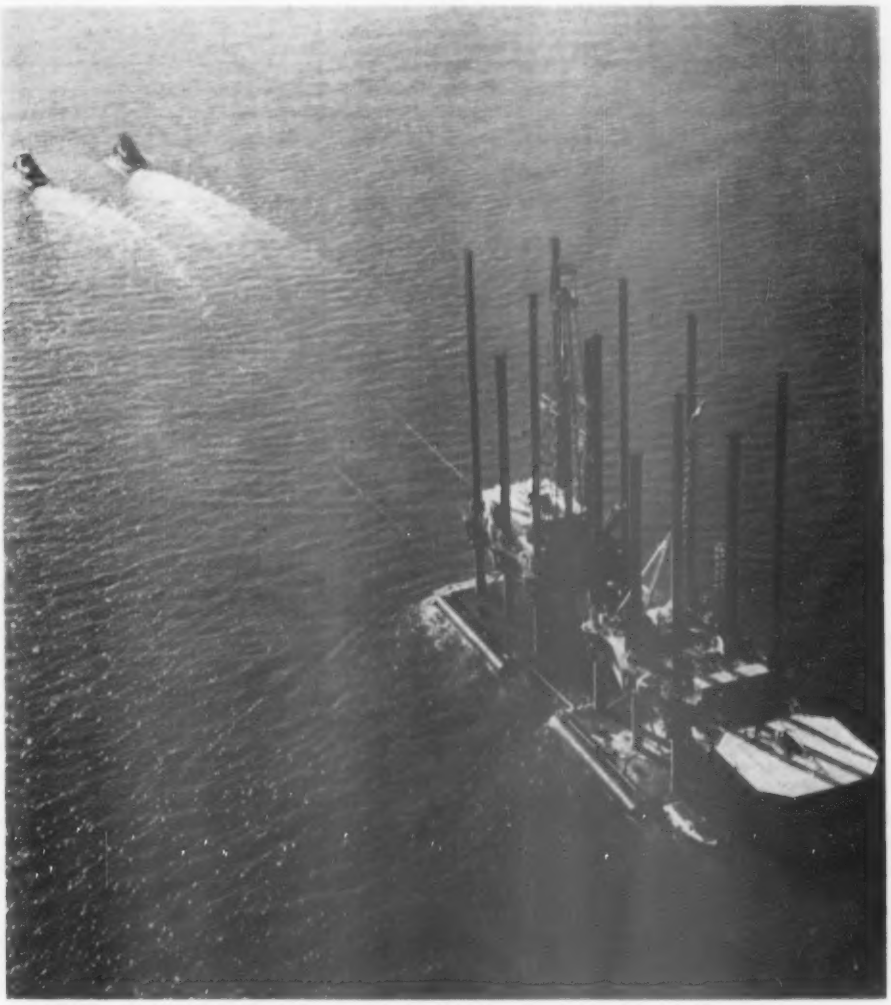
THIS WEEK . . . . . IN THE NEWS



MR. GUS, latest in the growing fleet of offshore drilling giants, moves out to location in Tract 249, 5 miles from San Luis Pass off the coast of Texas. The new mobile unit is designed to operate in water depth as great as 100 ft. and will drill its first well for Shell Oil Co. The rig is named for Gus Glasscock, of C. G. Glasscock Drilling Co., which owns it and will operate it under contract with Shell.

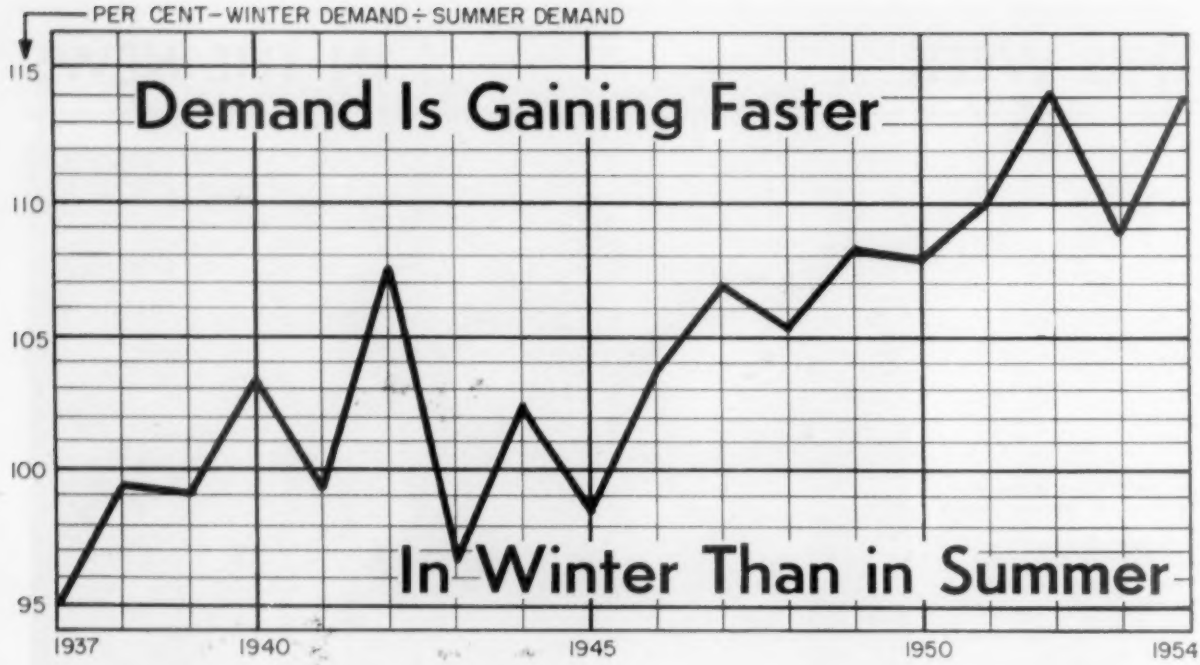
ECONOMICS—The industry has failed to tailor its crude production and refinery runs to the shifting seasonal demand. . . . This failure has cost the industry $250,000,000 in storage costs and abnormally low refinery realization in the last year. . . . Refiners have made some adjustments to the shift from summer to higher winter demand, but they haven't gone far enough. . . . Crude production is still too high during the period of lowest demand—summer. . . .

TECHNOLOGY—Standard Oil Development plans to spend $1 million to see if atomic energy can bring on a new era in petroleum processing. . . . S.O.D. will use radioactive cobalt in a new research laboratory to explore development of processes impossible today. . . . Radioactivity of cobalt S.O.D. will use is stronger than world's total radium supply and is most powerful supply of atomic material in use by industry today. . . .

INDUSTRY—Mass meeting of Texas oil men scheduled December 13 in Fort Worth in a move to form a solid front against imports. . . . W. M. Vaughey, I.P.A.A. president, called meeting, inviting Texas I.P.A.A. members and members of five associations of producers in the state. . . . ¶Texas Pacific Land Trust certificate holders approve transfer of mineral rights of trust properties to TXL Oil Corp., a new company. . . . ¶Two New York investment houses and a Dallas investment company form new oil company, Producing Properties, Inc. . . .

PIPELINES—Transcontinental president forecasts complete looping of 1,800-mile natural-gas line within few years. . . . ¶Completion of South Saskatchewan pipeline is second step toward providing United States outlet for Fosterton crude. . . . ¶North Dakota Public Service Commission rehears North Dakota Natural's proposal for major gas pipeline serving principal cities of the state. . . .

INTERNATIONAL—Current refinery construction in Australia means self-sufficiency in processing within the next year. . . . Last of four major postwar refineries scheduled for completion within 12 months, bringing total capacity to more than 150,000 bbl. daily. . . . ¶Japan will pour large sums into oil exploration in a 5-year program aimed at increasing its production. . . .



- **Because the industry hasn't followed this shift in seasonal demand it has shouldered an economic burden**
- **Refiners have made some adjustments, but producers' output is greatest during lowest demand summer period**

John C. Casper

FAILURE to tailor crude production and refinery runs to seasonal changes in demand has cost the oil industry at least $250,000,000 in the past year.

Seasonal demand has shifted and the industry hasn't followed suit. It has been an expensive oversight. Winter demand has grown faster than summer demand, but the reverse has been true of crude production. Refiners have recognized the demand shift to some extent, but not nearly enough.

The result has been an expensive burden made up of two things—increased cost of storing crude and products and the loss in refinery realization from abnormally low product prices.

Increased production of either crude or refined products during a period of low demand only adds to the total inventory load for which storage must be provided. Refiners will never be able to adjust total runs to cover all variations in demand out of current production, but they can do more with shifts in runs and yields than they have done in the past.

In many cases, refiners have held plant throughput at higher rates than necessary because of contracts to purchase crude. If crude production fails to follow trends in the demand curve, the refiner must store either crude or products. Many refiners prefer to carry finished products.

The actual cost of storing products has been a minor factor in the over-all loss due to excessive inventories, but the volume of storage space available is another matter. When a refiner's tanks are filled with either crude or products, he has to move some finished products if he is to handle incoming crude. To move products in a hurry, he quotes lower prices. It takes only a relatively small volume of distress material to establish spot market prices for a particular product, and if the oversupply continues, prices all the way down to the retail level will be lowered.

Troublesome gasoline . . . Gasoline has been the troublesome product for more than a year. Some marketers estimate that gasoline prices have been depressed at least 0.5 cent a gallon by distress selling due to excessive inventories which in turn has been caused by overproduction at refineries.

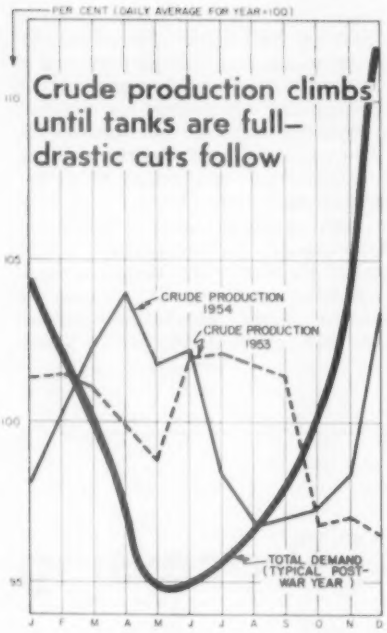
Total demand for gasoline, excluding areas on the West Coast, amounted to about 1,100,000,000 bbl. or 46,000,000,000 gal. in the past 12 months. If average refinery prices have been cut 0.5 cent a gallon by too much production, then this distress condition has cost the industry about $230,000,000 in additon to storage costs and storage losses.

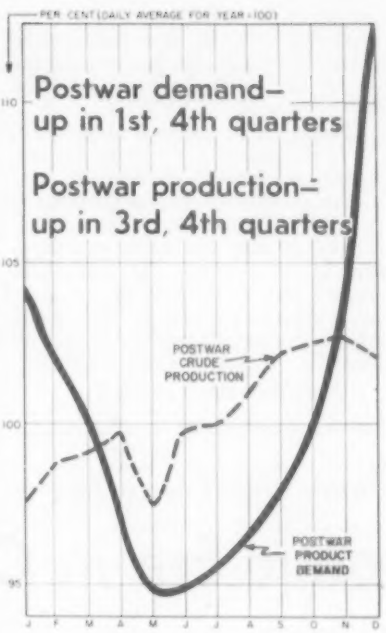
A large part of this overproduction can be traced to excessive refinery runs and high gasoline yields in the summer months of 1953, but industry statistics indicate that very little progress has been made since that time toward tailoring runs to a closer fit with seasonal changes in demand.

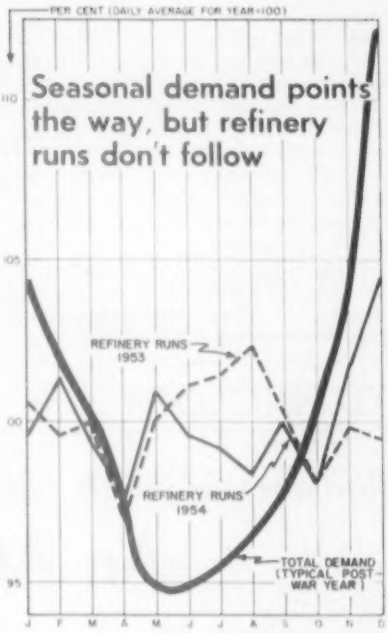
The demand shift . . . This shift in seasonal demand has been gradual over the past 15 years. Winter demand has grown much faster than summer demand, but crude production has not followed the trend. There has been some shift in refinery runs but not enough to prevent disproportionate increases in stocks.

The large chart at the top of the page shows that the demand for all products in the winter quarters of 1937—first and fourth quarters—was about 5 per cent less than demand during the summer months. Except for some abnormal seasonal changes during World War II, the portion of total annual demand credited to winter months has gradually increased.

Since the end of the war, the gain has been quite pronounced. Demand in the winter quarters of 1952 averaged 14 per cent more than summer demand for that year. The winter portion dropped off slightly in 1953 because of warm weather in both the first and last quarters of the year. However, if the weather this December is near normal, demand for the winter quarters


PER CENT (DAILY AVERAGE FOR YEAR=100)
Crude production climbs until tanks are full– drastic cuts follow
CRUDE PRODUCTION 1954
CRUDE PRODUCTION 1953
TOTAL DEMAND (TYPICAL POST-WAR YEAR)
110
105
100
95
J F M A M J J A S O N D


PER CENT (DAILY AVERAGE FOR YEAR=100)
Postwar demand– up in 1st, 4th quarters
Postwar production– up in 3rd, 4th quarters
POSTWAR CRUDE PRODUCTION
POSTWAR PRODUCT DEMAND
110
105
100
95
J F M A M J J A S O N D


PER CENT (DAILY AVERAGE FOR YEAR=100)
Seasonal demand points the way, but refinery runs don't follow
REFINERY RUNS 1953
REFINERY RUNS 1954
TOTAL DEMAND (TYPICAL POST-WAR YEAR)
110
105
100
95
J F M A M J J A S O N D

will exceed last summer's demand by about 13 per cent.

Production doesn't follow . . . The first small chart shows a comparison of crude production for 1953 and 1954 with the total demand curve for a typical postwar year. Demand was abnormally low last May, but even in a normal year, May will be the low month for total demand. Note that May demand in a typical year is about 95 per cent of the average for the total year while the December demand is at least 112 per cent of the year's average.

When total demand averages about 8,200,000 bbl. daily for the year, the spread between May and December amounts to almost 1,500,000 bbl. daily. The spread between May and December this year may be as much as 2,250,000 bbl. daily. This is based on a forecast average of 9,450,000 bbl. daily in December which would be 5.4 per cent higher than last December but only 5.3 per cent more than December 1952.

Producers and refiners cannot cover all of the spread between May and December through changes in production and refining rates, but part of the burden of excessive stock changes can be lightened through greater seasonal changes in production and runs.

Crude and product stocks accumulated at a rate of about 940,000 bbl. daily last May and probably will decrease more than 1,000,000 bbl. daily in December.

Crude production schedules have followed no definite plan for the past few years. Production has been permitted to remain at high levels until most crude storage is filled. If the flood of crude influences refiners toward excessive runs, product tanks may be filled also. This flush production is followed by a period of drastic allowable cuts in those states with laws permitting proration to market demand.

Crude production increased in each of the first 4 months this year and did not drop below the average forecast for the year until July. The peak was in April when demand was well below the average expected for the year. Production in April was higher than most estimates of probable production in December. Peak production in 1953 came during the summer months with July the top month.

In the charts . . .

The line on the large chart shows winter demand expressed as a per cent of summer demand. Point 105 means that daily average winter demand was 105 per cent of summer demand. The first and fourth quarters are considered winter quarters and the second and third are classified as summer.

On the three smaller charts, monthly figures are expressed as percentages of averages for the year. Crude production for January 1953 is plotted as 101.4, meaning that daily average production was 101.4 per cent of average production for the year.

The typical postwar demand curve is plotted from average demand figures for each month for the period 1946-53. Daily average demand for all Decembers in the period was a little more than 112 per cent of the average demand for all months of the period. The curve is rounded slightly to correct for distortion in May and June.

Postwar production . . . Average production in the postwar years has been influenced very little by changes in demand trends. The second small chart shows that averages of monthly production totals for the postwar period are below the average in the early months of the year, then climb to near the over-all average (100 on the chart) in June and July and are above the average in the late months of the year. This line indicates that there was very litle seasonal change, but that the gradual upward climb during the year was due to normal growth in total demand.

Pressure from crude production has been a factor in preventing seasonal changes in refinery runs in some of the postwar years. In other years, it is difficult to determine "which came first the chicken or the egg." Some proration authorities may be influenced more by high crude stocks than by excessive product inventories. Thus, the refiner may build excessive product inventories by near-capacity runs and at the same time be an influencing factor in continued high production since increased refinery runs will tend to keep crude stocks at a low level.

Refinery runs . . . The third small chart gives a comparison of refinery

runs in 1953 and 1954 with total demand in the typical postwar year. Note that high runs for the year 1953 came in the summer months or the period of normally low demand. Record runs for the year were reported for August when the average was 2.33 per cent higher than the average for the year. Note that every month from May through September was above the year's average or 100 on the chart.

Runs so far in 1954 have not varied as much as 2 per cent from the average forecast for the year. Cold weather in December may raise that month's average to about 4.4 per cent above the average for the year, but total demand in December is expected to be up about 16 per cent from the average for the year.

Capacity is no longer a major limiting factor in seasonal patterns for production and refining. In the early postwar years refiners were forced to operate at near capacity rates for most of the year to meet the rapidly expanding demand for products and crude production had to be held nearer maximum efficient production rates. Now, estimates of reserve producing capacity range from 1,500,000 bbl. daily to 1,800,000 bbl. daily, and refining capacity at the start of the year was at least 1,000,000 bbl. daily greater than refinery runs will average for the year.

Refining capacity on January 1, 1954 was about 8,000,000 bbl. daily on a calendar day basis which allows for normal down time.

Both producers and refiners now have enough reserve capacity to shift part of the burden of widening seasonal demands from stocks to production. Records of the past 2 years indicate that such a shift should pay dividends.

TECHNOLOGY

Radioactive cobalt pipe may point way to . . .

An Atomic Era in Oil Processing

George Weber

LINDEN, N. J.—Standard Oil Development Co. is betting more than $1 million that radioactive materials will usher in a new era in the technology of petroleum processing.

S.O.D. will build a new radiation laboratory at the Esso Research Center here to study applications of atomic energy which go far beyond the oil industry's established uses of radioisotopes as tracers. The new lab is slated for completion next April.

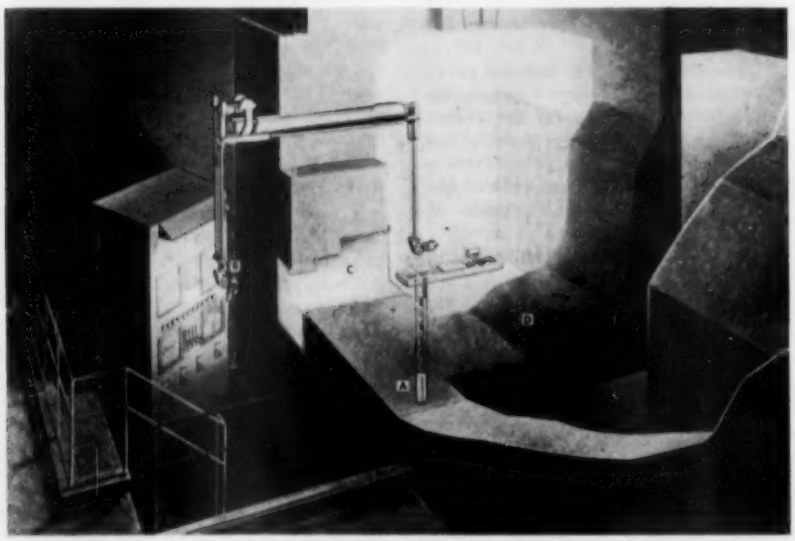
Certain types of isotope radiation are known to influence chemical reactions. Just which reactions are so influenced and how they can be carried out are the announced objectives of S.O.D. The long-range research project entails some big "ifs," but the company appears willing to ante up more than a million dollars to take the first look. The ultimate objective is the improvement of existing methods for manufacturing petroleum products and petrochemicals, and the possible development of processes not now possible. This could mean:

. . . **Polymerization** of light hydrocarbons at lower pressures.

. . . **Some application** to cracking of petroleum fractions as well as alkylation, isomerization, and other known processes may prove feasible, although no specific approaches can yet be revealed.

While it is much too early to reveal specific avenues of investigation, it appears the work shows definite promise. This is indicated by the fact the company is staking such a sizable sum that the project has merit. The $250,000 laboratory will figure in a preliminary program to cost four times that in the exploratory phase alone. Further pursuit of this basic study, using pilot-plant and semicommercial equipment, would extend and multiply the original investment.

Gamma radiation . . . The new labora-



LABORATORY "CAVE" as it will look at Standard Oil Development's new radiation laboratory. The "A" shows the location of the radioactive cobalt pipe in a storage well. "B" indicates the controls for the mechanical hands operated from in front of a lead-glass window, "C," which is more than 3 ft. thick.- Concrete walls "D" are more than 4 ft. thick.

COBALT PIPE for the new lab will look like this. The pipe has undergone neutron bombardment in an atomic pile for the past 2½ years.

tory will study the effect of gamma rays given off by a 13-in. length of 2-in. cobalt pipe. This source material has been undergoing neutron bombardment in an atomic pile for the past 2½ years at the Brookhaven National Laboratory.

It will be delivered to the finished laboratory next spring with an original strength of 3,500 to 4,000 curies and will represent the most radioactive single piece of cobalt known today. Its strength will be about 10 billion times that of a common luminous watch dial. It will be stronger than the total world supply of refined radium, which now aggregates about 2,400 curies.

Radioactive cobalt, or cobalt 60, is one of the isotopes which emit only gamma rays. These rays may be compared to X-rays. They can be dangerous to humans who are overexposed to them directly but they do not render exposed materials radioactive in themselves, as do neutron bombardment and other types of emission. Hence hydrocarbons exposed to cobalt 60 can be affected by the radiation during exposure but once removed from the source are perfectly harmless in a radioactive sense.

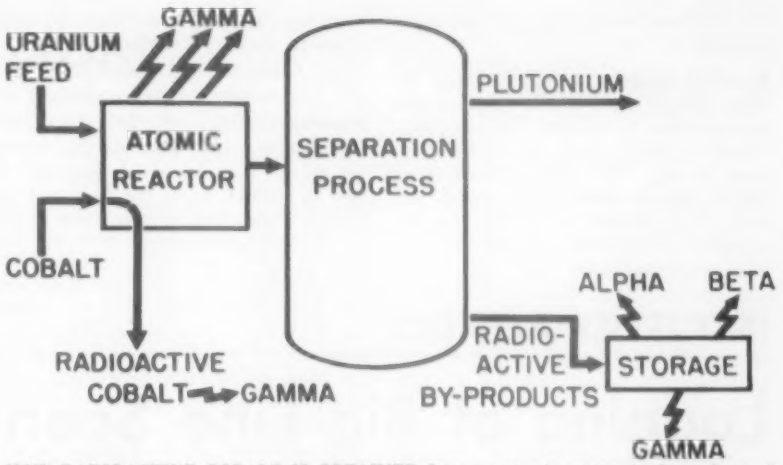
Exploratory possibilities . . . Early work will be purely exploratory.

It is known that gamma rays can break certain chemical bonds in molecules in a manner similar to thermal or catalytic cracking. The type and degree of such cracking will be studied.

It is also established that application of this form of energy can cause some molecules to join one another. In some cases it is suspected that this form of energy can bring about some such reactions which are not possible by other means. For example, gamma radiation of polyethylene causes a cross-bonding of polymers which improves the product for certain uses. This reaction has not been carried out in any other way.

Radiation may also serve as a substitute for heat and pressure in starting certain reactions among hydrocarbons. This application could require only enough energy to initiate a reaction which would then proceed to completion without the need for further energy input of that type. Such applications requiring only a fraction of the energy needed for completion would be practical on a commercial scale even when employing a relatively expensive source of radioactive energy.

The first order of business is to determine what hydrocarbon reactions are affected by gamma radiation, how they are affected and to what extent. But S.O.D. is not overlooking the practical objective of commercial application. If promising results are obtained



HOW RADIOACTIVE COBALT IS OBTAINED from an atomic reactor is shown here. A problem as yet unsolved is how to utilize the gamma rays dissipated from the reactor and also from the radioactive byproducts separated from plutonium. The latter must now be buried until their radioactivity decays.

their practical use is considered feasible using more powerful and less expensive radiation sources.

Other energy sources . . . The cobalt pipe will cost S.O.D. about $16,000. It is an ideal and not too expensive item for research alone. For practical uses the company sees two other potential sources for radioactive energy.

One is the vast amount of gamma radiation emitted by atomic piles. This radiation, now absorbed by elaborate shields, might be put to useful purpose by using hydrocarbon materials in surrounding coils as shields thus realizing some benefits from the radiation.

Another possibility lies in the by-products of the atomic reactor. These are presently considered a nuisance and must be isolated until they have decayed to a point where they are no longer harmful. Given a sufficient market for certain of these byproduct isotopes, it is possible to process them for separation and sale to industry. Processing would be necessary to isolate those elements which emit only gamma rays and to provide them in their pure state so that their radiation would be constant or calculable.

Laboratory design . . . The new laboratory, a 42 by 46-ft. building will house what is called the "cave." This 6 by 9-ft. cell will have walls and ceiling of 4-ft. concrete and will be accessible through a labyrinth and special doors.

The cobalt source will be stored in a well in the floor shielded by a thick lead cap. When so housed it is harmless to personnel entering the cave to examine samples and to set up equipment for experiments.

Operators will manipulate the cobalt by means of a pair of mechanical hands called master slave manipulators, observing their work through a lead glass window more than 3 ft. thick. By remote control they can remove the lead well cap, lift out the cobalt pipe and move it to laboratory apparatus or pilot-plant equipment containing petroleum materials.

Small samples can be placed inside the pipe for concentrated exposure. When an experiment is completed, the cobalt source can again be lowered to its well and the cap replaced.

Elaborate precautions have been taken against the possibility of human exposure to radiation. The pipe cannot be withdrawn accidently from the well when the cave is occupied. When it is out of the well during an experiment, the doors to the cave are securely locked.

Atomic know how . . . S.O.D. has several years of background in atomic research. President Eger V. Murphree served on the wartime government committee that helped establish the Manhattan project and is a member of the Atomic Energy Commission's general advisory committee.

Before the atom bomb, S.O.D. explored applications of atomic energy as early as 1938 using natural uranium as an energy source. In 1941, work was begun on a process for large scale production of heavy water and the company now has a consulting contract with AEC on heavy water.

The company later built a pilot plant for separation of U-235 from natural uranium and developed equipment and techniques for the AEC to separate plutonium from elements formed in an atomic reactor.

The new project stems from 2 years of research by S.O.D. utilizing the atomic pile made available to industry and science at Brookhaven. The results of this preliminary exploration prompted the decision to build the new

laboratory at Linden for more intensive research.

Practical results . . . Any practical results from S.O.D.'s atomic research will be available to industry for licensing. This is required of any atomic development before 1959 under present law. The company's policy, like that of the industry in general, would continue the licensing practice thereafter.

Jersey Standard's affiliate lays no claim to exclusive investigation in this field. Other oil and chemical companies are known to be conducting or planning similar work. In view of the fact that its cobalt source is the biggest yet to go into industrial research, it appears S.O.D. is in the vanguard of this new approach to peacetime application of atomic energy.

INDUSTRY AFFAIRS

Looping of Big Line Seen

Transcontinental official forecasts parallel gas system extending all the way from Texas to New York City area

NEW YORK.—Complete looping during the next few years of the 1,800-mile Transcontinental Gas Pipe Line Corp. system from the lower Rio Grande Valley to New York was forecast last week.

Tom P. Walker, Transcontinental president, said the major portion of the looping will be of 36-in. pipe, the largest being used for gas transmission.

Plans call for tying together the new and old lines about every 17 miles to make a highly efficient and much more dependable system.

Walker forecast an annual increase in sales of more than 100 million cubic feet daily resulting primarily from growth in space heating and mixed-gas conversions. Transco's market area includes densely populated metropolitan regions in New York, New Jersey, and Pennsylvania.

Expansion projects . . . A pioneer in use of 36-in. pipe, Transco is now completing the first phase of a super-inch looping system along its main line through Mississippi and Alabama. This project, costing an estimated $6,533,000, is the first big-scale use of 36-in. pipe in gas transmission *(The Oil and Gas Journal, October 18, page 76)*. The present looping system includes about 50 miles of 36-in. pipe.

Walker said two expansion projects now pending approval of the Federal Power Commission are to be combined into one construction program providing for looping of 45 per cent of Transcontinental's main line. This phase of the expansion program would make possible additional sales totaling 119 million cubic feet daily. It would bring allocated daily delivery to 684 million cubic feet.

This maximum delivery does not include an additional 136,500,000 cu. ft. that can be drawn from storage during severe winter weather.

The company's 1955 construction, together with replacement of this year's bank loans, will require financing next year of about $85,000,000.

Significance . . . Transco brought natural gas to the New York metropolitan area for the first time about 4 years ago when it completed its big line from Texas. The original line, longest ever built, cost about $268,000,000. It included 1,564 miles of 30-in. pipe, 85 miles of 26-in., and 183 miles of smaller pipe.

Since completion of the original line, Transco has expanded its facilities several times to meet the growing demand for gas in the East. It seems to have set the pattern for future pipeline expansion through its use of 36-in. pipe.

In the meantime, the company has expanded its reserves in the big gas-producing area along the Gulf Coast. At the end of last year, the company estimated its recoverable gas reserves at more than 4.13 trillion cubic feet, compared with 4.07 trillion cubic feet a year earlier.

The big Transco line taps about 60 gas fields in Texas and Louisiana. Although the majority of its output goes to the New York-Philadelphia-New Jersey area, Transco also serves public utilities along its line in Maryland, Virginia, North and South Carolina, Georgia, and Alabama.

Big Producer Completed

SPEARMAN, Tex.—A 1,296-bbl. per day confirmation well in Hansford County, Texas Panhandle, is the largest oil producer yet completed in this part of the Anadarko basin.

R. H. Fulton, Lubbock, completed 2 S. B. Lasater in Section 72, Block 45, H&TC Survey, 9 miles northeast of Spearman, in the Atoka-Pennsylvanian sand at 7,182-7,214 ft. Gravity of the oil is 39.5°. The well reportedly flowed gas at the rate of about 1,000 M.c.f. per day.

The prolific producer is a southwest offset to Fulton's 1 Lasater, a 498-bbl. per day discovery.

TXL Acquires Lands

Transfer of Texas Pacific Land Trust property made

NEW YORK.—Texas Pacific Land Trust certificate holders have approved a plan to transfer mineral rights in trust properties to a new company, TXL Oil Corp.

The certificate holders were told that the trust's oil and gas properties could be better and more profitably utilized if they were operated by a company "having powers and authority ordinarily exercised by modern oil companies." Texas Pacific Land Trust was organized under a trust agreement drawn in 1888, long before the oil and gas discoveries on its properties.

To be transferred are the rights held on approximately 1,797,000 acres in 29 Texas counties. Trust income in 1953 from properties to be transferred to TXL totaled $7,108,000.

Texas Pacific Land Trust certificate holders will receive four shares of stock in the new corporation for each certificate and retain their interest in the assets of the trust.

Drilling Boost Planned

COLORADO SPRINGS.—Colorado Interstate Gas Co. will double its drilling activity next year.

The reason? The Federal Power Commission's decision that pipeline companies can value their own production on a "fair field price" basis gives these companies a much bigger incentive for finding and producing gas.

L. M. Poe, Colorado Interstate attorney, said the company will drill 110 wells in 1955. In 1953 the company drilled only 40 development wells, including 2 dry holes. This year the firm has completed 50 wells and has eight operations currently active.

The new FPC rate-making policy, adopted last April, allows transmission companies to value their own produced gas at the average weighted price being paid in the same fields. Previously the companies were required to base their price on the actual cost of acquiring the reserves.

Solid Imports Front

That's the goal of the I.P.A.A. as it asks Texas groups to sit down and adopt plan of attack all can agree on

FORT WORTH.—Independent producers of Texas will attempt to forge a solid front against imports of foreign oil at a mass meeting here December 13.

Past differences between vocal Texans as to the proper way of restricting imports handicapped domestic producers in asking Congress for relief. But when the next Congress meets in January, the hope is that all Texas producers will speak with one voice.

To this end W. M. Vaughey, president of the Independent Petroleum Association of America, has sent invitations to the Fort Worth meeting to five associations of producers in the state: Texas Independent Producers and Royalty Owners Association, Panhandle Producers and Royalty Owners Association, North Texas Oil and Gas Association, West Central Texas Oil and Gas Association, and East Texas Oil Association.

The plan is to have the officers and individual members of these groups meet with Texas members of I.P.A.A. December 13 to agree on a formula for relief and a program for action.

This will be the opening gun of the fight on oil imports in the next Congress.

All six associations are on record as believing that imports should be curtailed. Some have suggested specific means for doing this, some have not. What's needed now, the group leaders believe, is a single plan of procedure. And, it is felt, as Texans go, so will go the rest of the independent producers throughout the country. That's why this will be purely a Texas powwow.

Why unison? . . . Back of this six-association conference lies the sad experience of domestic producers with the Simpson bill in 1953.

The Simpson bill was sponsored by coal interests. It proposed to put a quota limitation on imports of crude oil and heavy fuel oil. This wasn't exactly the legislative route—nor the type of sponsorship—oil producers favored, but it offered some relief—perhaps the only relief possible during that session of Congress.

So the I.P.A.A. endorsed the Simpson bill and worked for its passage. But many producers, most of them vocal Texas independents—thought the quota plan was unfair, clumsy, and full of bugs. What's more, they said so out loud. And Congress listened. With much other opposition to the bill, and with the oil producers divided, the bill was defeated in the House July 24, 1953.

After this event, many congressmen told producers that defeat could be attributed in very large measure to the lack of a united opinion within the domestic segment of the industry. Some congressmen said they got more opposition to the Simpson bill from Texas than support for it.

The plans . . . For the past couple of years, while producers fumed over increasing imports, there have been almost as many limitation plans as there were independent producers. Both T.I.P.R.O. and I.P.A.A. were divided within their membership.

Last April T.I.P.R.O. obtained approval of its members to support a "tax-equalization fee" to be imposed on imported crude. This excise tax would not be called a tariff, but would presumably equal the difference between the taxes paid by foreign producers and the higher taxes paid to federal, state, and local jurisdictions by domestic producers.

It being admittedly difficult to compute all types of tax payments in terms of exact cents per barrel, the endorsers of this plan agreed to accept a figure that would approximate the difference, say about "a dollar and a nickel" a barrel.

Then last August I.P.A.A. came out with what it called a "reciprocal trade formula." Any foreign country would be allowed to import oil into the United States at the present low excess tax (10½ cents per barrel) up to the limits of a formula based on the value of all U. S. merchandise which that country purchased the previous year.

Beyond that, imports would be subject to a higher tariff. Curiously, the tariff rate produced by this formula also worked out to $1.05 per barrel.

So "a dollar and a nickel" may be the rallying cry to bring together these two groups—and all other independent producers—even though the figure was arrived at by two entirely different approaches.

Flexibility an asset . . . Last month the I.P.A.A. annual meeting instructed its officers to seek legislation restricting imports by:

. . . The suggested reciprocal trade plan or any modification of it "that would do the job,"

. . . An excise tax or tariff of $1 per barrel "or such other amount that will be adequate,"

. . . A quota plan, or

. . . Any combination of the above "or any other legislative plan" that will prevent excessive oil imports.

This leaves the ways and means wide open. I.P.A.A. can go along with any other group and any other plan that seems likely to get wide support.

This flexible directive also is the result of sad experience. For most of the past 25 years I.P.A.A. has been fighting imports. At various times of crisis its officials have been under instruction to work for a specific duty, quota, or other device. This made it impossible to compromise or shift procedure, although there were times when a compromise might have won approval whereas the specific I.P.A.A. plan was rejected.

This year the independent producers are determined to keep from falling into traps of their own making. The Fort Worth meeting is designed to develop a strategy that all will support but to leave tactics to spokesmen on the firing line.

Before December 13, it is anticipated, the nation may know the recommendations of the President's cabinet committee on energy supplies and resources policy. This group has been making a study of oil imports, among other things, and is scheduled to report to the White House December 1.

If the cabinet group makes a recommendation on imports which are at all to the liking of independent producers, the Fort Worth meeting doubtless will get behind it for a big push.

If the recommendation is disappointing, or if the report is not made public, the independents will prepare to go it on their own.

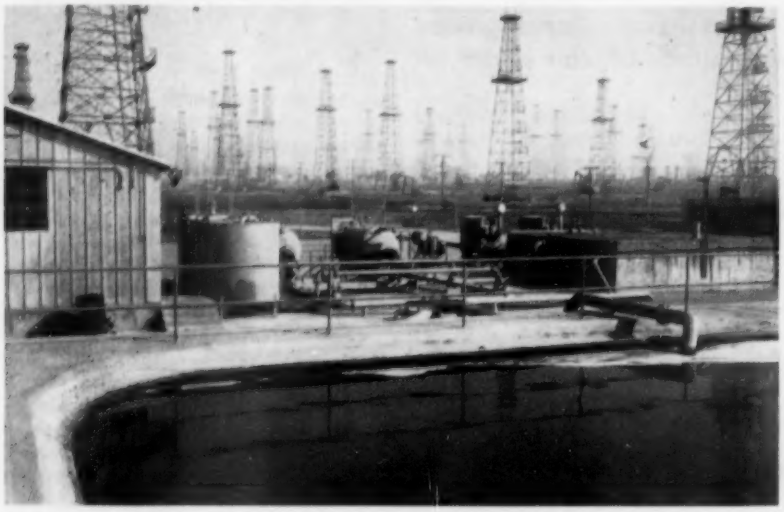
Gasoline Plant Started

SILSBEE, Tex.—Ground is being cleared near here for construction of a new gasoline plant for American Republics Corp. and others. The plant will process 20,000,000 cu. ft. of gas daily.

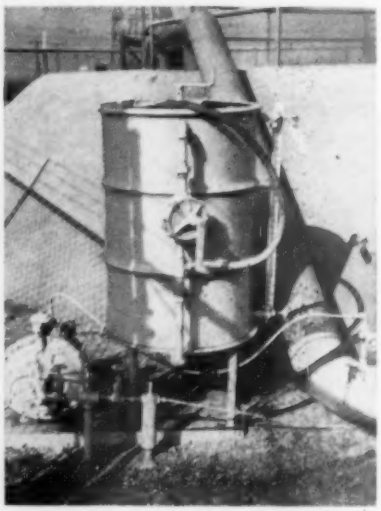
Disen Co., Houston, will build the plant. It will go on stream in about 8 months.

The new plant, not quite as large as the American Republics plant 3 miles north of here, will process gas and distillate from South Hampton gas-distillate reservoir.

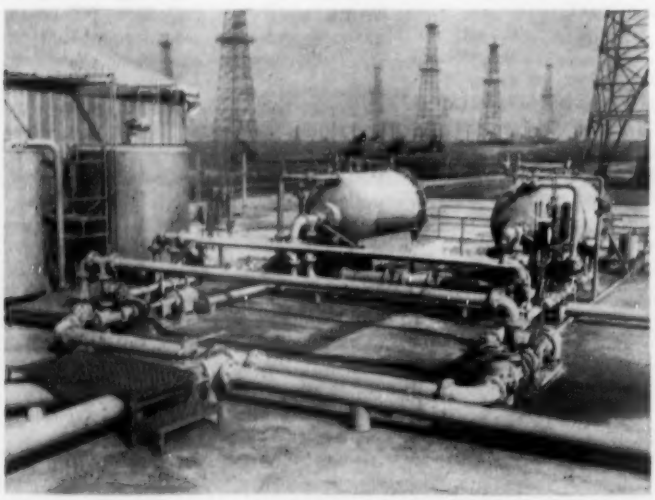
Companies associated with American Republics are Houston Oil Co., Clegg & Hunt, and Kirby Petroleum Co.



All Brine The salt water is processed by a chemical firm which extracts iodine before it is used in the cooperative Dominguez water flood comes from the field itself. collected and . . .



Quaternary Ammonia compounds are added to control corrosion and algae. Then . . .



Filter Equipment consisting of two diatomaceous earth, leaf-type filters process the brine before plastic lines carry it to . . .

Injection Wells like this one used in an irregular five-spot pattern with input regulated by positive-bore choke.

Dominguez Flood May Set Pattern

D. H. Stormont

LOS ANGELES.—If it is successful, and three oil companies are betting $1,350,000 it will be, the Dominguez field water flood may become the pattern for similar projects among California operators wary of unitization.

The unique flood started last July is the first large scale—for California—water flood in the state. It is a cooperative venture of Union Oil Co., Shell Oil Co., and Dominguez Oil Fields Co. on a 118-acre pool isolated from the remainder of Dominguez field by two transverse faults. It is a cooperative rather than a unitized operation.

Water has been injected into the first zone of the east-central fault-block at the rate of 10,000 bbl. daily since July without any appreciable increase in production from the 16 producing wells. The operators expect results within the next few months.

Most of the 17 injection wells are still taking water under vacuum and, since the depletion-type reservoir has been under production since 1924, several million barrels of water may be required to replace the fluid and gas already produced.

Producers in this zone, the upper of the field's eight sands, were completed flowing at the average rate of about 700 bbl. daily. Total output of the two properties was only 700 bbl. daily, a

per-well average of 22 bbl., when injection was started. Current output of the two leases is about 600 bbl. daily.

How it's done . . . Four injection wells on the boundary of the two leases involved in the project are creating a wall of water between the two to prevent migration of oil from one property to the other.

Union is operator of the water-treating facilities and the injection system. Union and Shell conduct their individual floods using an irregular five-spot flood pattern. The total volume of water going into each lease is determined by an engineering committee made up of representatives of each company.

Dominguez Fields, which holds a one-half interest in Union's Hellman lease and a one-eighth interest in Shell's Reyes lease, does not participate in actual operations.

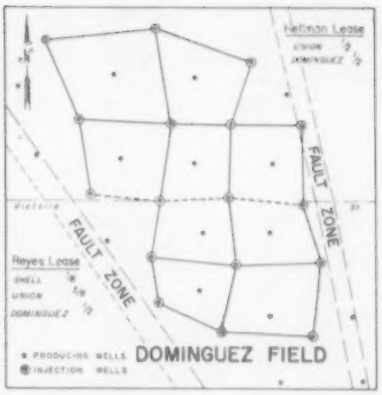
Structural conditions . . . The 118-acre pool is separated from the remainder of the field by faults, and production on the north and south flanks is limited by sand pinch-outs.

The structure is an elongated anticline with a northwest-southeast axis. The crest parallels Victoria Street, the boundary between the Reyes and Hellman leases and the formation dips from 0 to 15° with the south flank the steeper.

The zone being flooded is topped at about 4,000 ft., with the average well depth at 4,230 ft. Average zone thickness is about 350 ft., of which about 190 ft. is oil sand. Average porosity of the sand, of Repetto (Pliocene) age, is 28 per cent and average permeability is 250 millidarcys. Reservoir pressure at the start of the flood varied from 50 to 300 psi. Gravity of the oil produced averages 31° A.P.I.; average oil viscosity at reservoir temperature is 2.3 centipoises.

Aside from the four input wells drilled along the common boundary, all water wells are converted oil producers. Preparing them for their new service, tubing was pulled, the hole bailed clean, and perforations opposite the first zone scraped and washed to assure ready entry of water. No steps were taken to improve any shortcomings in the injectivity profile of the 350-ft. pay interval.

Water facilities . . . Aside from small volumes of water being used in other small floods, brine produced from the entire Dominguez field is being returned to the first zone flood. The brine, about 11,000 bbl. daily, is collected by a chemical company and run through an iodine extraction plant and discharged



MIGRATION from one lease to another is blocked by a water ridge created with water injected into four wells along the line separating the two leases (dotted line on map).

into a 5,000-bbl. capacity raw-water storage pit. Enroute it receives an injection of quaternary ammonia compounds for algae and corrosion control.

The water is passed through two 400 sq. ft. leaf-type pressure filters which employ diatomaceous earth as a filtering medium. These normally operate in parallel, but one takes over the entire load while the other is being back-washed and precoated. The filtered water is stored in a 600 bbl. capacity, reinforced concrete pit.

The brine is picked up by either of two single-stage centrifugal pumps, rated at 10,000 bbl. daily at 300 psi., and run through a low-pressure injection system to input wells which will take water at low pressure (250 psi. pump pressure). Though not in use to any extent at this time, there also is a high-pressure injection system. It is supplied by five vertical triplex pumps, each rated at 2,500 bbl. daily at 2,000 psi. pressure.

All injection lines are cement lined. Orifice type water meters are used at each injection wellhead and at strategic locations for master meters. Rate of water injection to each well is controlled by a positive-bore choke.

Monterey Buying Fullerton

LOS ANGELES.—Monterey Oil Co. expects to acquire this week all assets of Fullerton Oil & Gas Corp., formerly Fullerton Oil Co.

The $52,000,000 deal began last March when Alban Corp. and Church Oil & Gas Co., assisted by Monterey, offered to buy 80 per cent of Fullerton shares at $71.50 a share *(The Oil and Gas Journal, April 5, page 64).*

Fullerton has a daily production of about 6,000 bbl., with its largest holdings in Fullerton field of West Texas. Other properties are in California, New Mexico, Oklahoma, and Wyoming, including three natural-gasoline plants—two in Texas and one in California.

Monterey figures aquisition of Fullerton properties will increase its net oil reserves to 66,812,000 bbl. and dry-gas reserves to 56 billion cubic feet.

Offshore Line Studied

LOS ANGELES. — Plans for an underwater pipeline from Seal Beach to its drilling island 1½ miles offshore are being studied by Monterey Oil Co. following completion of the second well on the earth-filled structure.

The new well flowed 535 bbl. of 27.9° gravity crude through a 26/64-in. choke from a depth of 5,923-6,300 ft. Following completion, it and the first well started producing into a barge moored alongside the 75-ft. diameter structure, which was built in 42-ft. deep water.

CANADA

Gas Price To Be Set

Trans-Canada expected to fix well-head figure soon

CALGARY.—Public hearings under way here will answer one of the key questions facing Trans-Canada Pipe Lines, Inc., officials—the price to be paid at the well head for gas.

The price question is expected to be settled as result of hearings on an application of Alberta Gas Trunk Line, Ltd., to build a 340-mile gathering system in Alberta. The Alberta system will funnel gas into Trans-Canada's 2,200-mile line, which will run from Alberta to eastern Canada.

The hearings opened here before the Alberta Petroleum and Natural Gas Conservation Board.

During a recent address in Toronto, N. E. Tanner, Trans-Canada president, stressed the importance of the Calgary hearings.

Tanner said early approval of the Alberta system will enable Trans-Canada to determine the well-head price of gas going into the big line. He said Trans-Canada has offered producers 14 cents per thousand cubic feet at the Alberta-Saskatchewan border, but said the net price to producers will be less by the amount charged to move the gas to the intake point.

"Our agreements with producers stipulate higher payments for gas in future years and we are very optimistic about our ability to make satisfactory arrangements with the owners as soon as the gathering and other relative costs are

determined," Tanner said. "Some disappointment has been voiced regarding our offer, but I am confident the producers recognize the rigid economics which dictate the beginning of our operation and they will cooperate with us."

The well-head price determination also is expected to aid Trans-Canada in dealing with natural-gas consumers along the eastern end of the line. Tanner said in his recent speech that the company is faced with the problem of bringing together "the producers at one end of the line and the customers at the other end."

Few details of the Alberta gathering system have been released. The line is scheduled to start at the south end of the Edmonton-Bonnie Glen gas line and run south about 130 miles to about 10 miles northeast of Calgary. An 80-mile section going southeast to Bassano is planned from here, followed by a 130-mile section on east to the Saskatchewan border.

The line is scheduled to collect gas from the Bonnie Glen, Westerose, South Westerose, Homegien-Rimbey, and Cessford gas fields.

Branch lines are expected to be extended throughout Alberta as the demand for natural gas increases; however, Alberta Gas Trunk Line currently does not plan to build any facilities other than the main gathering system. The branch lines apparently will be built by other companies.

New Outlet in Canada

Completion of South Saskatchewan line is second step in plan to move Fosterton crude to Minnesota refinery

REGINA, Sask.—Second phase of a three-pipeline project giving crude from Saskatchewan's Fosterton field an important outlet in the United States has been completed.

The new 153-mile South Saskatchewan pipeline from Fosterton field to Regina was undergoing tests last week. First crude through the 16-in. line is expected to reach Regina by January 15, 1955.

At Regina, the $10,000,000 line ties in with the Interprovincial Pipe Line Co. system extending from Edmonton to Superior, Wis. Fosterton crude will be shipped through the Interprovincial system as far as Clearbrook, Minn. From there it will go through Minnesota Pipe Line Co.'s 16-in. line going to the Minneapolis-St. Paul area.

The Minnesota pipeline, final segment of the three-line system, is scheduled for completion by June, 1955.

First major outlet . . . The interconnecting system will move medium-gravity crude from the Fosterton area to Great Northern Oil Co.'s 25,000-bbl. refinery now under construction near St. Paul and Minneapolis. It will provide the first major outlet for Fosterton crude.

The Fosterton field, northwest of Swift Current, was discovered by Socony-Vacuum Oil Co. of Canada, Ltd., in 1952. The original strike was made on a farmout on acreage held by Woodley Canadian Oil Co. and Southern Production Co.

A few months later, Socony-Vacuum tapped the Cantuar and Success oil fields in the same area. The three companies—Socony-Vacuum, Woodley, and Southern Production —now have more than 160 wells capable of producing in these fields.

The Fosterton-Regina pipeline, with an initial capacity of 20,000 bbl. daily, is expected to start moving about 15,000 bbl. per day from the Fosterton area by the time Great Northern's refinery goes on stream. Completion of the refinery is expected to coincide roughly with completion of the Minnesota pipeline.

Economic factors . . . Producers in the Fosterton field decided on the co-operative pipeline system as the most feasible means of getting their crude to a suitable market.

The South Saskatchewan line is owned by the three producing companies or their parent companies. Socony-Vacuum has a 50 per cent interest in the line, Woodley has 30 per cent, and Southern Production 20 per cent.

Woodley and Southern Production also are part-owners of the Minnesota pipeline, each holding a 40 per cent interest. Remaining 20 per cent is owned by J. Howard Marshall, vice president of Signal Oil & Gas Co., Fort Worth *(The Oil and Gas Journal, August 2, page 59)*.

Because of the relatively low gravity of the Fosterton crude, it has only limited demand in Saskatchewan. It averages about 21° to 24° in gravity, making it unsuitable for big-scale refining in the light-oil processing plants in Saskatchewan.

Saskatchewan refineries produce a high proportion of gasoline, which has a ready market since the province is predominantly agricultural.

The St. Paul-Minneapolis area, on the other hand, is highly industrialized and has adequate markets for both gasoline and heavy products.

Secondary outlet . . . A small percentage of crude from the Fosterton area will be refined, for a while at least, in Saskatchewan.

South Saskatchewan Pipe Line Co. is preparing to start construction on a short (1,760-ft.) 10-in. spur line connecting its main system with the small Regina refinery owned by Consumers' Cooperative Refineries, Ltd.

Although the Regina refinery can use some of the medium-gravity crude, it will be a small factor in Fosterton's economy. The refinery, which has a crude capacity of 12,000 bbl. per day, is expected to process only about 3,000 bbl. of Saskatchewan crude daily during the next few months.

Until completion of the Great Northern refinery, most of the crude from the Fosterton area is expected to go into Interprovincial storage facilities at Regina pending transfer across the border to the United States.

The South Saskatchewan line was built by Fulton-Banister, Ltd., a partnership formed by Banister Construction Co., Edmonton, and R. H. Fulton, Lubbock, Tex.

Williams Brothers Co., Tulsa, has contract for the Minnesota pipeline job.

Refinery to Slash Runs

REGINA.—A 2-month shutdown of its cracking unit and a drastic cut in crude throughput has been ordered by Consumers' Co-Operative Refineries, Ltd., at its refinery here.

Unusual harvest conditions, which resulted in a lower-than-normal demand for tractor fuel, combined with an oversupply of gasoline caused the company to announce it will cut runs from 12,000 to 3,000 bbl. per day for the 2-month period.

Two Refineries To Expand

MONTREAL. — Approximately $5 million of a $6 million sinking-fund debentures issue by Husky Oil & Refining, Ltd., will be applied to the acquisition, modernization, and expansion of two recently acquired refineries.

In the past month, Husky has purchased the 4,000-bbl. daily Riverlake Oil, Ltd., refinery at Fort William, Ont., and the 2,000-bbl. daily refinery owned by Trans Empire Oils, Ltd., at Moose Jaw, Sask. *(The Oil and Gas Journal, November 15, page 165.)* Husky plans to expand the capacity of each to 5,000 bbl. daily.

Line Study Reopened

North Dakota Natural cites greater reserves in new bid for permit to build 274-mile gas pipeline across state

BISMARCK, N. D.—North Dakota Natural Gas Transmission Co. moved back into the North Dakota gas pipeline picture last week as the Public Service Commission began a rehearing of the company's plan for a major system to deliver Tioga and Beaver Lodge gas to the state's principal cities.

The commission was told that:

... **Proved reserves** of North Dakota Madison lime gas have increased from 297 to 400 billion cubic feet in 7 months.

... **The gas supply** contracted to North Dakota Natural has been expanded to include all Nesson anticline fields as far south as Charlson in McKenzie County, an area 36 miles long and up to 6 miles wide.

... **Early ideas** that the Silurian contained condensate production are erroneous and it must be considered an oil formation.

North Dakota Natural proposes to build a 274-mile, $11,017,200 system from Tioga to Fargo to Grand Forks. It submitted the first application for a project to move gas from the Tioga-Beaver Lodge area, but the picture later was complicated by an application of Northern Natural Gas Co. to serve the same area.

The new figure on gas reserves was given the commission by C. H. Keplinger, Tulsa consultant, who said the additions were due to new discoveries and extensions. In the absence of further deep drilling, he said, there is no change in estimated proved reserves of 263 million cubic feet in the Devonian and Silurian formations, Keplinger said.

C. V. Millikan, Amerada Petroleum Corp. chief engineer, testified that there is no evidence to show that there is a large supply of wet gas in the Silurian. Two of the commission's requirements last May 24 in giving North Dakota Natural conditional approval were that it must get Amerada to agree to drill enough Silurian wells to assure a standby supply of 30,000 M.c.f. daily and to undertake an underground-storage project.

Millikan said that of seven wells which have penetrated the Silurian, two tested the formation by actual production. There is no evidence to show that more than 3,000 M.c.f. of wet gas or 2,000 M.c.f. of residue gas would be available from any Silurian well, he said.

Beginning next year, the commission was told, Amerada plans a limited Silurian program of two or three wells over the next 3 years, but since each well costs $300,000 nothing more ambitious can be undertaken. As many as 60 wells might be required to achieve 30,000 M.c.f. daily.

As for underground storage, Millikan said one barren storage possibility has been outlined, but it is too costly to drill and test yet.

The Northern Natural application to serve North Dakota is now pending, but a spokesman for the commission said he doubted it would ever be heard.

Oil-Black Plant on Stream

Columbian Carbon Co.'s oil-black plant near Franklin, La., recently went on stream with an annual capacity of 20,000,000 lb. This is one-third the design capacity, which will be reached when construction is completed in about a year. Feed stock for the plant includes crude oil barged from Gulf Coast refineries and natural gas from nearby fields. The plant employs a process involving an electrical precipitator, three stages of cyclone collection, and a bag filter of improved design. Over-all collection efficiency is essentially 100 per cent.

Industry Briefs

SANTA FE.—The New Mexico Oil Conservation Commission has set the state's oil allowable for December at 245,062 bbl. daily—the same as in November. The figure includes 10,000 bbl. daily for new production. The basic unit allowable was retained at 40 bbl. per day.

NEW YORK.—Earnings for the first 9 months of 46 companies reporting to Carl H. Pforzheimer & Co. showed an increase of less than one per cent over the same period last year. Aggregate net income for the three 1954 quarters was $1,714,555,000 compared to $1,698,734,000 in the first 9 months of last year.

NEWCASTLE, Wyo.—Possibility of establishing a natural-gasoline plant is being studied by several major oil companies. The plant would utilize natural gas now being flared in the Clareton oil field.

AUSTIN. — A 1-day oil-recovery conference will be conducted December 11 at the University of Texas under sponsorship of the Gulf Coast and Southwest Texas sections of the American Institute of Mining and Metallurgical Engineers, the University of Texas, and Texas A. &M. College. The technical program will feature six papers dealing with oil recovery, phase behavior, and fluid flow. Paul Weaver, distinguished professor of geology at Texas A. & M. and former assistant to the geological vice president of Gulf Oil Corp., will be feature speaker at the banquet.

PHILADELPHIA.—Sun Oil Co. has set December 30 as the date for effecting a five-for-four split of the company's common stock.

U. S. Oil Needs Studied

Industry nears last expansion goals set by Government; new survey will cover military, civilian requirements

WASHINGTON.—The oil industry is rapidly approaching the expansion goals set by the Office of Defense Mobilization during the Korean emergency, but a new study is now being made to determine if these goals are still adequate in the light of changed economic and military conditions.

The nation's ability to produce for both war and peace has been supported by an increase of more than 2,600,000 bbl. daily in refining capacity and the construction of 21,000 miles of natural-gas pipeline, the Joint Congressional Committee on Defense Production pointed out in its fourth annual report last week.

But the need for a review of the industry's expansion programs was emphasized in a report filed with the committee by the Interior Department covering the activities of the Oil and Gas Division and other defense agencies in the department.

"These goals were established on the basis of a wartime petroleum supply-demand study made by PAD utilizing military assumptions and plans then available," the report stated.

"Since these studies are now 3 years old and there have been important changes in the mobilization base and mobilization requirements, the division is now starting a completely new and very extensive wartime petroleum supply-demand survey."

Scope of survey . . . The new survey will include military plans and military petroleum requirements as supplied by the Defense Department. It also will take into consideration the essential industrial and civilian requirements of this country and friendly foreign nations, together with their estimated military requirements.

A completely new and up-to-date inventory also must be made of the capacity of the oil and gas industries, at home and abroad, to produce, transport, and deliver products required at the places needed, the committee was told.

"This survey will determine whether and where there are potential deficiencies in available supplies," is was explained. "The deficiencies will be identified and ways devised to prevent or alleviate them. To the extent that the estimated productive capacity will fall short of meeting the essential needs, additional expansion in productive capacity will be required and may necessitate revision in goals as now established."

Industry's expansion . . . Most of the expansion programs set up for the industry are developing satisfac orily, the committee was informed.

Certificates for accelerated tax amortization have been issued for 21,000 miles of oil pipeline, and additional expansion is still under way toward a goal of 26,950 miles to be constructed by January 1, 1956. Refining capacity last January 1 was only 100,000 bbl. short of the goal of 8,100,000 bbl. daily set for that date. Indications are the 8,750,000-bbl. goal programed for January 1, 1956 will be reached.

Somewhat less favorable conditions, however, have been encountered in other phases of the program. Expansion of storage capacity to 1,360,000,000 bbl. by 1956 is not expected to be accomplished. Present outlook is for 1,200,000,000 bbl. The natural-gas liquids goal of 1,280,000 bbl. per day also is lagging, and probably the actual expansion will leave the total 140,000 bbl. short of that figure.

The greatest lag, however, has been in the natural-gas transmission program which called for 53,100 miles of new line under 16 in. in diameter and 22,850 miles of larger line.

A former ruling of the Federal Power Commission, reversed at the end of last year, provided that any gain through accelerated tax amortization be offset by a reduction in rates. The influenced the industry against using a quick write-off, and even now there is still some apprehension in the industry.

Last year pipelines constructed by gas-utility companies totaled only 21,000 miles as compared with the 75,680 miles programed by OGD for 1953, 1954, and 1955.

Onassis Troubles Mount

U. S. files $20,000,000 tanker fraud case just week after Paris suit charges shipowner with bribery in Saudi Arabia

WASHINGTON. — The troubles of Aristotle Socrates Onassis, Greek shipping magnate, continued to mount last week with the latest legal salvo fired at him in the form of a $20,000,000 Justice Department suit.

The suit filed in a New York federal court followed closely on the heels of a lawsuit filed in Paris which could possibly end in criminal prosecution and a jail sentence of up to 5 years for Onassis.

The Government says it is entitled to the $20,000,000 earned by 16 war surplus vessels because they were purchased illegally from the Maritime Commission by the Onassis group. Seven of the 16 ships were tankers acquired by U. S. Petroleum Carriers, Inc., and the American Marine Corp. from the old Maritime Commission in March and April 1948.

Named in the complaint in addition to Onassis were Merope Onassis Konialdis, Constantine Konialdis, Nicholas Konialdis, Sociedad Industrial Maritime Financiers Ariona Panama, S.A., Sociedad Maritime Miraflores Limitada, Petroleum Carriers of Panama, Inc., Transatlantic Financiera Industrial, S.A., U. S. Petroleum Carriers, Inc., and Victory Carriers, Inc.

The United States suit . . . The Government says because the purchasing corporations posed as bona fide United States citizens, the Maritime Commission sold the vessels that could legally be sold only to citizens. Actually, the Government claims, control of all the corporations was in the Onassis group, all of whom are aliens. The suit asks title to all the ships and all their earnings since the sale.

The new suit is in addition to proceedings already pending against Onassis and his associates in this country. Criminal indictments are pending and 16 civil libel suits to forfeit 16 vessels to the United States have been brought against Onassis in the past 15 months.

The Paris suit . . . The suit for fraud, which carries with it the possibility of criminal prosecution, has all the elements of a cloak-and-dagger spy movie.

Spyridon Catapodis, who claims he negotiated the controversial tanker agreement with Saudi Arabia for Onassis, is suing for the equivalent of $560,000 in commissions and benefits.

Catapodis says Onassis' signature was written in disappearing ink when he signed a document promising to pay Catapodis if he was successful in negotiating the Saudi Arabian agreement. Catapodis said he had made photostatic copies of the document before the ink completely disappeared.

The Catapodis charges will be examined by a magistrate. If prosecution is instituted and Onassis convicted, he could get up to 5 years imprisonment and an appropriate fine. The suit was filed in France because both Catapodis and Onassis are French residents.

Onassis denies all . . . In New York, Onassis denied the Catapodis charges. He said they were a part of an all-out propaganda effort which has been carried on to discredit and jeopardize his agreement with Saudi Arabia.

That agreement brought international repercussions when it was first disclosed last winter. Its terms gave Onassis' tankers certain preference rights in the transportation of oil produced in Saudi Arabia in exchange for a per-ton payment by Onassis.

The storm of disapproval resulted in diplomatic protests by several countries, including Britain and the United States.

Company officials consider it contrary to fundamental relationships between oil companies and governments and an extremely dangerous precedent. These fears found expression in the recent Iranian oil settlement which included a clause specifically barring Onassis-type deals.

Onassis weakens . . . There have been increasing signs that Onassis is about to give in before the widespread condemnation of what he may have at first regarded as a brilliant stroke of business. A spokesman for Panama Maritime Co., an Onassis company, said recently changes would be made in the agreement in the near future. However, he said, there is no question of revising the entire agreement.

Depositions alleging bribes were paid to high Saudi Arabian officials have recently been made public in this country and abroad. These depositions were sworn to September 27 before the Acting British Consul General in Nice, France, by Catapodis.

The depositions claimed large sums of money were paid to the Saudi Arabian Minister of State, the Minister of Finance, and to officials in King Saud's palace. It has been reported that the King Saud has ordered a sweeping investigation of government trade and financial operations for the last 10 years.

Tanker Deals Made

Sun Shipbuilding, Ingalls get contracts for 4 ships

WASHINGTON.—The Navy's program for providing the Military Sea Transportation Service with a high-speed fleet of modern tankers got into high gear last week with the award of contracts for the construction of four vessels.

The Maritime Commission, which is acting as agent, also is studying proposals of a half-dozen tanker companies for the long-term charter of 15 tankers which is part of the program. The offers covered 23 vessels, all at or below the $5 per deadweight ton per month maximum specified in legislation enacted by Congress last session.

Contract for three of the government-built vessels (the maximum that may be built in any one yard) was awarded to the Sun Shipbuilding & Dry Dock Co. at a fixed price of $6,581,191 for each ship.

The fourth tanker will be built by the Ingalls Shipbuilding Corp., Pascagoula, Miss., at a price of $8,089,400.

A bid of $7,850,000 on each tanker was made by Bethlehem Steel Co., but included a provision for an additional $380,000, making it the high bid at $8,230,000.

The new tankers will be of 25,000 deadweight tons with a cargo capacity of 190,000 bbl. and a normal sea speed of 18 knots. They will be 614½-ft. long, 83½ ft. wide, and will have a draft of 31 ft. 10 in. All four will be built within 600 days.

The Maritime Commisison also has announced the signing of the first contract under the "trade-in" program authorized by Congress last session. Cities Service Oil Co. will turn in five T-2 tankers for credit against the construction of two supertankers at the Sparrows Point (Md.) yard of the Bethlehem Steel Co. The contract also covers the trade-in of two more tankers by April of next year for a credit to be applied on the construction of a third new vessel.

Cost of the new ships is estimated at $8,000,000 each. The first two are expected to be completed early in 1956.

The new vessels, which will be the first supertankers especially built for carrying multiple grades of oil products, will be able to carry up to 18 different grades of oil or gasoline at a speed of over 17 knots. The 650-ft. tankers will have a cargo capacity of approximately 158,000 bbl. each.

Tank-Truck Study Due

WASHINGTON. — How far the carrying capacity of the nation's tank-truck fleet could be increased through emergency operating procedures in the event of war is being worked out by the National Petroleum Council.

A thorough study of the tank-truck situation in peace and war, including the first complete census of tank trucks used in and by the oil industry since January 1952 and an estimate of the number and capacity of privately owened semitrailer tanks that could be used in over-the-road service in an emergency, is being made by the NPC at the request of Director Hugh A. Stewart of the Oil and Gas Division.

S. F. Niness of the Leaman Transportation Co., Dowingtown, Pa., was named last week by Walter S. Hallanan, chairman of the council, as head of a seven-man committee to make the study. Lee R. Cowles of Standard Oil Co. (Ind.) was named chairman of a 15-man subcommittee which will make the census.

Census Plans Made

U. S. to make first tally of production since 1939

WASHINGTON.—The first census of oil and natural-gas producing activities since 1939 will be taken next year.

Shortly after the first of the year, questionnaires will go out to the operators of the more than 500,000 producing oil and gas wells in this country asking for information on 1954 operations.

Other activities of the industry, such as refining and distribution, will be covered in the same type of nose-counting for manufacturing and business, also due to be made next year.

Forms tailored to fit the production industry will be used for the producers' census. Coverage will be complete. To insure that all operators are canvassed census bureau workers are now combing the records of state commissions to which producers report, the Social Security Service reports, and the Internal Revenue Service files to take off the names of producers who may not be on existing government lists.

The questionnaires will call for information on the ownership of producing wells; employment and payrolls; man-hours of production, development, and related workers, by type of work; costs of supplies, fuels, electric energy, contract work, and machinery; water

used; horsepower rating of power equipment; capital expenditures; cost of drilling wells; and products and services.

Separate forms will be used for oil and gas production, oil and gas field contract services, natural-gas liquids, and offshore-oil and gas operations.

FPC Lends an Ear

Agency says it will listen to anyone on rate setting

WASHINGTON. — Everybody who wants to tell the Federal Power Commission how to regulate rates of independent gas producers and gatherers under the Phillips decision will be given an opportunity next month.

A blanket invitation has been extended to all members of the industry—producers, gatherers, interstate pipeline companies, distributors, consumers, groups and associations, state commissions, municipalities, and any other interested persons—to submit written views and comments by December 13.

Those who wish to present their views in person will be given time to do so at oral arguments which will open December 15 before the full commission.

Two conditions . . . The commission has laid down only two conditions with respect to its search for advice. It will not consider any further argument on the matter of its jurisdiction over the producers and gatherers. And, those who wish to argue at the December 15 hearings must file applications for time by December 3.

Orders already have been issued prescribing regulations to govern the 5,000 independent natural-gas producers it estimates are subject to regulation under the Supreme Court's June 7 decision. Now, the commission says, it is seeking to decide what methods should be used in determining the producers' rates.

This is a matter "of national importance," the commission said. It is recognized that there are basic differences between the operations of a producer and those of a pipeline company.

The extended deadline for the filing of certificate applications and rate schedules by producers and gatherers falls due this week. At mid-November about 850 such applications had been received and they increased steadily in volume toward the end of the month. At the same time several hundred proposed rate increases under escalation and other contract provisions also have been filed, only a small proportion of which have been suspended for investigation.

WATCHING WASHINGTON

Bertram F. Linz

Petrochemicals Growing

Oil and gas are getting into the chemical industry in a big way.

The current rate of investment in new facilities is difficult to figure, but in the past 12 months $58,850,000 has been put into projects already completed for chemical production from oil and gas. Another $58,000,000 worth is under construction, according to a survey by the Manufacturing Chemists' Association.

Probably more important than the dollar investment is the fact that this total of $116,850,000 in a specialized field is exceeded only by the expansion in plants in four other similarly specialized areas—the production of polymeric materials, chiefly for plastics; agricultural chemicals, mostly for fertilizers; synthetic organic materials, and chemical production of metals and alloys such as magnesium, titanium and zirconium.

New plants for chemical production from oil and gas are scattered over a number of states but the bulk of investment is in five oil and gas producing areas. Texas leads with an investment of $29,500,000 in plants already completed or building, followed by Illinois with $21,000,000, Louisiana with $17,600,000, Pennsylvania with $15,000,000, and California with $6,000,000.

No Jail Sentences

The Government has been successful in recovering a number of surplus tankers wrongfully purchased from the old Maritime Commission but the Justice Department hasn't done too well toward sending anyone to prison for the conspiracies to violate shipping laws which it said were involved in the deals.

Grand jury investigations in 1953 resulted in indictments against a number of individuals, including former Massachusetts Congressman Joseph E. Casey and Aristoteles S. Onassis, whose contract with King Saud for the tankering of Saudi Arabian oil made news this year. Also involved were several shipping corporations in which the individual defendants were interested.

Eight of the defendants and four corporations made an out-of-court settlement of their civil and criminal differences with the department last May by agreeing to pay the United States $110,000 in fines, return 19 ships and pay the Government $4,000,000 for their use.

In September, the indictment against Casey was dismissed because he had testified before a Senate committee investigating the tanker deals and thereby acquired protection against prosecution under a little-known immunity clause in the Shipping Act of 1916. Four other defendants also were dismissed at that time, leaving only Julius C. Holmes, former Minister to London, and E. Stanley Klein, New York financier.

This month the department asked dismissal of the indictments against Holmes and Klein, explaining that since the Government had decided not to appeal the decision clearing Casey it was felt it would be "impractical and unfair" to proceed against the remaining two defendants.

In one of the civil cases the Government received more than $2,000,000 and the return of six tankers. No criminal charges were involved.

Smog Bothers Congress

Congress will probably do something about the smog problem next session but the general belief in Washington is that it will be some years before the air over Los Angeles and other industrial centers will be pure enough to breathe.

First steps in a government attack on smog have been taken by Sen. Thomas H. Kuchel of California, who has asked the Secretaries of Interior, Commerce and Health, Education and Welfare for "constructive ideas" that may be incorporated in legislation setting up a study program.

Kuchel says all federal, local, public and private agencies should pool their resources. His legislation will include authorization of a coordinated program of research and investigation by various federal agencies under direction of the Public Health Service.

Since the oil industry itself has been fighting the smog problem and is blamed in some quarters for the bad situation in Los Angeles, the Interior Department has a definite interest in the matter.

FPC Looks Again

Commission reopens probe into Phillips' gas rates

WASHINGTON. — The rate case which led to a Supreme Court decision putting natural-gas producers under government regulation has been revived by the Federal Power Commission.

Phillips Petroleum Co. was told last week the commission is taking another look to see if FPC rates imposed on the sales of its natural gas are "unjust, unreasonable, unduly discriminatory, or preferential." If they are, the commission says it will fix "just and reasonable rates" to be charged by the company.

How it started . . . The case was first before the FPC in October 1948 and the commission thought it had washed its hands of the matter in August of 1951 when it decided it had no jurisdiction over Phillips as a natural-gas company under the Natural Gas Act.

The State of Wisconsin, the Wisconsin Public Service Commission, and the cities of Detroit, Kansas City, and Milwaukee contested the FPC ruling in the U. S. Court of Appeals here. This court reversed the FPC and was upheld by the Supreme Court. It was this sweeping decision that put all producers and gatherers of gas under rate regulation and sparked the controversy that still rages.

What commission did . . . The commission's first step in investigating Phillips' rate was to suspend, as of October 1, rate increases amounting to $805,300 a year to cover Texas production taxes and escalations in the company's basic rate contracts. Phillips was allowed to file proposed rate increases of about $144,700 a year to cover the Texas producing tax, however.

Criticism . . . The power commission's handling of escalation clauses—it has permitted some increases and denied others—came under heavy fire last week from one of the FPC's most vociferous critics, Russell B. Brown, counsel for Independent Petroleum Association of America.

Pointing out that the commission is taking action without announcing any standards by which it is acting, Brown called it "regulation in its worst form."

"Admittedly," Brown said, "the commission is faced with a difficult and almost humanly impossible task if it undertakes to adjudicate on the merits of each price increase provided in the thousands of producers' contracts. . . .

"This is no excuse, however, for arbitrary and discriminatory administrative action. There is no excuse that can be offered . . . since its own action has brought about this situation. The order is too broad and sweeping and should be corrected if further confusion and chaos is to be prevented."

FPC Restraint Limited

WASHINGTON.—The Federal Power Commission is keeping hands off Magnolia Petroleum Co. and Ohio Oil Co., but not natural-gas producers generally.

This was made clear last week by Willard W. Gatchell, FPC general counsel, commenting on the court orders obtained by the two companies in a New Orleans federal court. The court directed the FPC to hold up any enforcement of the controversial order 174-A until it could review the cases.

Gatchell told the five power commissioners they could go on enforcing the order as it pertains to all other natural-gas producers.

"These orders, of course, must be respected by the commission," Gatchell said. "In my opinion, the commission is not authorized to take any action . . . with respect to either of these two companies as long as the stay orders are in effect.

"However, these orders have particular applicability only to proceedings under order 174-A as applied to these two companies . . . the commisison is under no restraint from the court to refrain from consideration of order 174-A as applied to other companies."

SOUTHWEST

Selling Job in Gas

Convince consumers high field prices help, or accept federal control, Naff warns

DALLAS.—Gas producers have a big selling job to do in a hurry if they want to get out from under federal regulation.

At least this is how an interstate pipeliner views the situation.

George T. Naff, president of Texas Eastern Transmission Corp., told a Dallas Petroleum Engineers Club meeting here that the producers probably won't get the Natural Gas Act amended next year unless they launch a concerted drive now.

This drive, Naff said, should be designed to lay out the facts for all to see and to show why everybody will suffer if federal control is not thrown off.

Although there are thousands of producers, there are millions of consumers, Naff said, and this alone means that producers will inevitably be defeated in the coming congressional battle if they don't play their cards right.

Who needs selling . . . The eastern consumer, Naff said, has seen his gas bill hiked five times in recent years. He is aware that these hikes have originated with the producer. He is also aware there will be more increases in his gas bill due to escalation and favored-nation clauses. It is up to the producer, Naff said, to show why the consumer's interests will be hurt if a federal lid remains clamped on field-gas prices.

The consumer isn't the only group which must be educated, Naff said. There are two others almost, if not equally, as important. These are the distributing companies which accept the gas from the interstate lines and the state public-utility commissions which have the power of granting or denying rate increases.

Distributors feel, he said, that the producer is making a large and unjustified profit since his product is in great demand and no controls have been placed on this profit.

On the other hand they know that every time the price of gas is raised to them they have a difficult job of convincing the public utilities commissions that a compensating price hike is justified.

The distributing company and the state agency must be convinced before the next congressional session that the gas producer is not reaping a windfall. These two, plus the consumer, must also be shown that federal regulation will not halt gas-price hikes for good but soon will result in dwindling supplies of a premium fuel and higher prices for it.

This, Naff said, is a job which must be done quickly, and only the gas producer can do it.

Uranium Firm In Texas Deal

MIDLAND, Tex.—Sabre Uranium Corp., Grand Junction, Colo., has paid $1,350,000 for two interests in chunks of developed oil-producing property in West and West Central Texas.

The deals were negotiated with El Capitan Oil Co., Midland, and Paul Moss, Odessa, Tex., for a 69 per cent interest in five wells in Aspermont Lake field, Stonewall County, and with

Gustave Ring and James Earnest, Washington, for a 37½ per cent interest in two wells in Pegasus field of Midland and Upton counties.

The Aspermont Lake wells will continue to be operated by El Capitan, while Magnolia Petroleum Co., operator of the Pegasus unit, will operate the Pegasus wells.

The Aspermont Lake production is in the northeast quarter of Section 128-DH&TC and the Pegasus wells in the northeast quarter of Section 29-40-4s-T&P.

President of Sabre Uranium, a recently organized company, is Hugh M. Craigi, Grand Junction. Robert F. Thompson and Jack C. Vaughn, both of Dallas, are vice presidents and directors.

Company Formed

Investment houses team up to buy producing property

DALLAS.—A new $10,600,000 oil company, Producing Properties, Inc., has been formed here by a group of oil and financial interests to purchase and operate producing oil and gas properties.

The new firm was organized by three investment houses: Rauscher, Pierce & Co., Inc., Dallas; Hemphill, Noyes & Co., New York; and Shields & Co., New York.

It is headed as president by A. Knox Tyson, former president and director of American Republics Corp. and currently managing partner of Slick Oil Co., Ltd. Tyson, who will receive 50,000 shares in the new company and an option to buy 50,000 more, will continue as managing partner of Slick and will divide his time between the two companies.

Other officers of the new company are: W. Rufus Brent, independent oil operator, vice president, treasurer, and secretary; and Gerald J. O'Leary, of Shields & Co., vice president.

Directors include: Tyson; Brent; O'Leary; Ruston L. Ardrey, senior vice president of Republic National Bank, Dallas; Alfred S. Foote, vice president of J. P. Morgan & Co.; Philip Kraft, president of Newmont Oil Co.; H. N. Mallon, president of Dresser Industries, Inc., and a partner in Slick Oil; John H. Rauscher, of Rauscher, Pierce & Co.; H. V. Sherrill, partner of Shields & Co.; and Robert R. Spence, partner in Hemphill, Noyes &Co.

What is planned . . . Producing Properties has retained San Juan Exploration Co., Dallas, to find and appraise desirable oil properties, to furnish engineering and accounting services, and to produce the properties after they are purchased.

In most cases, the new firm expects to acquire producing properties subject to reserved oil or gas payments from production. It will conduct no exploratory operations except on undeveloped lands which it may be required to buy in a deal for established production.

Nash Buys Production

WICHITA FALLS.—Nash Oil Co., of Wichita Falls, has purchased the former Consolidated Oil Co. properties in North Texas from American Indian Oil Corp., Dallas.

The deal included all stock in the company plus 123 producing oil wells on 6,065 acres in Archer, Montague, Clay, Jones, Wichita, Wilbarger, and Young counties and 7,000 acres of undeveloped leases. Part of the 41 oil-producing leases involved are being water flooded and 13 existing water input wells also changed hands in the purchase.

American Indian Oil Corp. owned the properties only briefly. It purchased Consolidated Oil stock and production recently from W. T. Knight, founder of the company in 1924 and chairman of the board since 1939.

In addition to the Consolidated Oil purchase, Nash Oil announced that it had acquired the L. T. Burns Estate's York "A" lease in Archer County. The "A" lease has 20 wells completed in the Gunsite sand, with a total allowable at present of 125 bbl. of oil daily.

Three-Legged Derrick

First 36-L spudder with a tripod derrick is being used by Strait Drilling, Inc., in a cable-tool operation in Butler County, Kansas. The 70-ft. derrick is assembled on the ground, hinged to its base, and raised to drilling position. The derrick, which requires no guy wires, is easily moved from one location to another. Bucyrus-Erie Co., South Milwaukee, Wis., is manufacturer of the derrick.

Two Floods Asked

Added recovery from each set near 1,000,000 bbl.

AUSTIN.—The Texas Railroad Commission last week was asked to approve two widely separated waterflood projects which estimates showed would recover upwards of 1,000,000 bbl. each of secondary oil.

Standard Oil Co. of Texas disclosed plans for a five-spot pilot flood of the 4,300-ft. Delaware sand under its Reagan and McElvain lease in Wheat field of Loving County in far West Texas. The other big flood is proposed in Cook County.

If the pilot on the 12-well, 460-acre lease is successful, Standard will expand it to a lease-wide operation, with ultimate additional oil recovery estimated at 1,300,000 bbl.

The company plans to inject fresh water from the 120 to 170-ft. level through a closed injection system at a rate of about 500 to 1,000 bbl. per well per day and under a pump pressure of about 100 psi.

Production from this lease since its first well was completed in 1930 totaled 1,628,224 bbl. as of the first of the month. Reservoir pressure has dropped from an initial 1,850 psi. to a present figure of 150 psi. All producers are marginal pumpers.

Wheat field, a wide flat terrace structure, was discovered in 1925. It presently takes in 4,100 productive acres with 125 producing wells.

Cook County project . . . A group of seven companies and individuals petitioned the commission for the green light on a full-scale water flood of the 1,100-ft. Strawn sand in the T.C.U. area of Cook County Regular field, in Cook County, North Texas.

The operators expect secondary-recovery operations in this 25-year-old, 535-acre field to net an additional 1,000,000 to 1,200,000 bbl. of oil.

Applicants for the flood permit, representing all operators in the field, were: Seneca Oil Co., James F. Smith, Dodson & Igelhart, J. P. Flusche, Clyde J. Bohner, J. M. Russell et al, and Hollandsworth Oil Co.

Ground floor spot gives . . .

. . . Stanotex Leader Role

HOUSTON. — Standard Oil Co. of Texas is well on its way toward becoming a leading Texas tidelands operator.

Like its sister, California Co., which got in on the ground floor and is now the largest producer of offshore oil in the Pelican State, Stanotex jumped in early. It plans to leave no stone unturned in a speedy development of its Texas tidelands holdings.

During the past 11 months, Stanotex has:

. . . Brought in the first important oil discovery on the Texas tidelands, 53 State Tract 948, 1½ miles off Padre Island, Kleberg County.

. . . Drilled a directional hole on the same platform which proved successful.

. . . Laid a flow line from the platform to shore to move the oil to the Corpus Christi refining area.

. . . Installed another four-well platform in the same vicinity and will drill from this new location soon.

The company will drill a minimum of 18 wells off South Texas during the next 4 years. Under terms of state leases which Stanotex acquired on 18,000 acres at the December 1953 land sale, the company must drill at least one well on each 1,000 acres. Wells in this area have been estimated to cost approximately half a million dollars each, or, roughly $9,000,000 for the exploratory tests alone.

Standard of Texas, however, thinks it will spend "at least" $50,000,000 in the Texas tidelands during the next 5 years.

It acquired more than 17,000 acres off the upper Texas coast, on the outer Continental Shelf, at a government sale recently, paying more than $11,000,000. One 5,760-acre tract was acquired for $4,500,000.

H. L. Smith, vice president, says it will be early next year before actual drilling gets under way in the deeper water on the outer Continental Shelf. For the present, the company will be engaged in proving up more reserves in the South Texas area, which lies within the 3-mile limit from shore.

Potential run . . . An official state potential test was run on the Kleberg County discovery well last week. Final test showed a flow of 254 bbl. of 40°-gravity oil from the upper Frio, through perforations from 7,760-66 ft., using a 10/64-in. choke. Tubing pressure was 700 psi. and gas-oil ratio of 376 to 1.

The Texas Railroad Commission has set an allowable of 200 bbl. daily for the Padre area discovery. Stanotex calls the new area the Chevron field.

Texas Tidelands Well Dry

HOUSTON.—Humble Oil & Refining Co., disappointed in offshore operations several years ago by a $3,000,000 dry hole, is suffering again from a similar development.

The company's first test in the Texas tidelands since the new Submerged Lands Act was signed, has been abandoned as a dry hole at 15,000 ft. It is the third Texas tidelands failure this year.

Humble reported that the wildcat, on state-owned lands off St. Joseph's Island, was abandoned after unsuccessful attempts were made over a period of weeks to bring in some oil shows. The company plans one more South Texas tidelands wildcat later this year.

Cost of the dry hole was estimated at about $1,000,000.

In the other two Texas failures, Stanolind Oil & Gas Co. sank a million dollars in a dry wildcat on the outer Continental Shelf 25 miles east of Galveston, and Gulf Oil Corp. spent a similar amount on its Tract L-774 about 8 miles off Mustang Island.

World Briefs

The Russian Government has pulled out of the joint Soviet-Hungarian companies, including those controlling the oil industry, and is reported to have taken similar steps in Romania and Bulgaria. A Russian announcement in Moscow said agreement had been reached with Hungary for the sale and transfer of the Soviet share of the mixed companies to Hungary. Included was the Russian-Hungarian oil company, Masolaj.

Another stratigraphic trap discovery has been made in the Weser-Ems district of West Germany in the exploratory well, Dueste 8, drilled by Wintershall, A.G., about 3 miles east of Aldorf field. Tested at 2,850 ft. in the Valendis of the Lower Cretaceous, the well flowed 220-250 bbl. daily through a 1/6-in. choke. Wintershall drilled six dry holes on the structure during the war and made the Aldorf field discovery in Dueste 7.

A sizable extension of Hohne field has been made by Deutsche Erdoel by its well, Hohne 108. Drilled 1.2 miles northeast of the former edge of the field, Hohne 108 was brought in for a production of 190 bbl. of light oil daily through a ⅛-in. choke from a depth of about 4,495 ft.

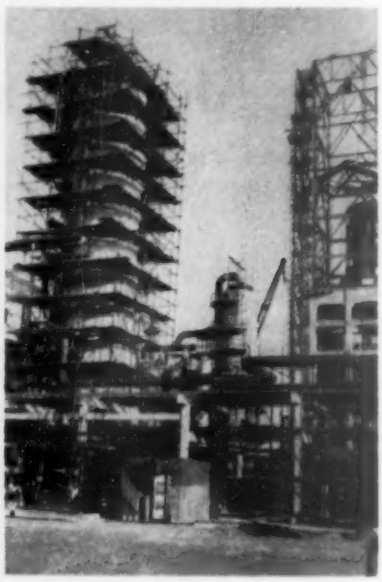
A small T.C.C. catalytic cracking unit at the Petitjean, French Morocco, refinery of Soc. Cherifienne des Petroles, has been officially inaugurated by M. F. Lacoste, the French resident general in French Morocco. The unit, designed and engineered by Hydrocarbon Research, Inc., has a capacity of about 3,200 bbl. daily. The finery utilizes the company's nearby local crude production.

India's first major refinery, a $32,000,000 plant at Bombay, has been officially opened by Standard Vacuum Oil Co. The 25,000 bbl. refinery first on stream last fall, 6 months ahead of schedule *(The Oil and Gas Journal, September 6, page 76)*.

Arabian American Oil Co. and the Harvard School of Public Health will undertake a 5-year, $500,000 research program to discover a vaccine for the prevention of trachoma, one of the world's oldest known diseases which blinds or impairs the vision of its victims. Aramco will furnish $100,000 a year and the facilities of its new medical center in Dhahran, Saudi Arabia, for the program. Harvard will provide the professional and technical staff for the work.

A small natural-gas field discovered 5 years ago in Tunisia has been brought into commercial production by SEREPT, a French company in which the French Government holds a majority interest. About 580,000 cu. ft. of gas daily is being moved from the field at Cap Bon in the northern part of the protectorate to the capital at Tunis through a newly completed 40-mile, 5-in. pipeline. Several wells in the field have a potential of 1,000,000 cu. ft. daily, but pipeline movement is limited by Tunis' requirements.

ORTHOFLOW fluid catalytic cracking unit at new Kwinana refinery



THERMOFOR catalytic cracker at Altona

New refineries will bring . . .

Shift in Australian Economy

AUSTRALIA'S fast-growing refining industry soon will be able to meet the country's present demand for petroleum products.

The last three of the country's four major postwar refineries will be completed within the next 12 months. As a result, Australia's imports of petroleum products will virtually cease, while its crude imports will continue to grow.

Refinery construction in Australia during the past 3 years has cleared the way for the major transformation in the country's petroleum economy. For years, Australia had only a few small refineries, and most of its requirements were met by imported products. The big Abadan refinery was a major supplier before the 1951 nationalization of the Iranian oil industry.

The four new Australian refineries, all projects of large international oil companies with marketing operations in the country, will raise Australian refining capacity to more than 150,000 bbl. daily by the end of next year. Previous capacity was about 20,000 bbl. daily.

Consumption of major oil products in Australia last year totaled 5,261,000 tons, or about 105,000 bbl. daily. This reflected an increase of 1.4 per cent over the 1952 total. Of the 5,425,000 tons of total imports in 1953, 23.2 per cent came from Indonesia and 21.5 per cent from Bahrain.

The plants now being completed are the Standard-Vacuum refinery at Altona, scheduled to be commissioned next month; the Anglo-Iranian refinery at Kwinana in western Australia, due to come on stream early next year; and the Caltex refinery at Kurnell, to be opened next summer.

Shell plant . . . First of the new Australian refineries to go into operation was the 28,000-bbl. per day plant of Shell Co. of Australia, Ltd., which was opened last March at Geelong, near Melbourne. Work is continuing at Geelong on the second stage of the program, comprising a fluid catalytic cracking unit of 13,000 bbl. daily capacity and a polymerization plant.

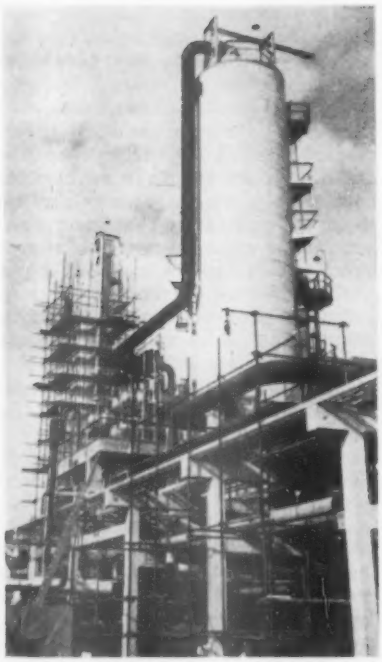
The Shell refinery moves part of its production to Melbourne through a 36-mile, 8-in. pipeline, the country's first pipeline of importance.

Standard-Vacuum . . . Commissioning of the 27,500-bbl. Altona facilities, expected about December 10, will be slightly ahead of schedule. The refining company, Standard-Vacuum Refining Co., a wholly owned subsidiary of Standard-Vacuum Oil Co., recently placed a £1,600,000 sterling loan in London as part of the approximately £20,000,000 ($63,000,000) cost of the project.

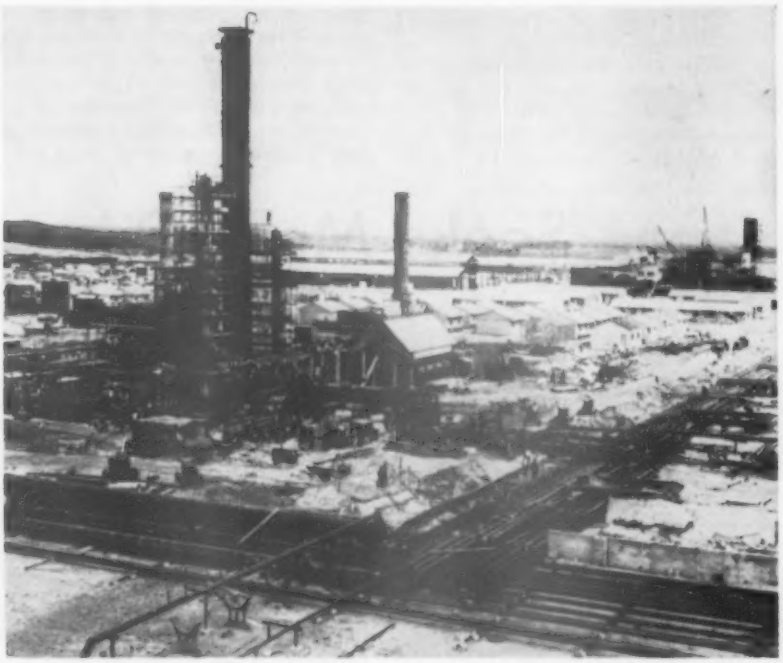
The original refinery was completed by Vacuum Oil Co., Pty., Ltd., in July 1949, with a capacity of about 1,300 bbl. per stream day (later raised to 2,500 bbl.) for the production of lubricants and asphalts. Decision to enlarge the plant was made in 1952. Process design was undertaken by the refinery-engineering division of Socony-Vacuum Oil Co., Inc., and the mechanical design and construction contracted to C. F. Braun & Co.

The new facilities include a 25,000-bbl. per stream day crude unit of conventional design. The T.C.C. unit is the standard 7500 model with a total feed capacity of 19,000 bbl. daily. There also is a naphtha splitter tower to divide the overhead into light and heavy fractions.

Part of the gas from the T.C.C. unit is to be used as refinery fuel, and plans are under way to sell a portion of the gas to the local Gas & Fuel Corp. for blending with domestic gas



CRUDE unit at Stanvac's Altona plant



CALTEX refinery at Kurnell, showing crude unit and power plant

manufactured from brown coal. Three 6-in. pipelines move products from the refinery to the marketing company's bulk terminal located about 5 miles away.

Further additions to the plant already decided on are an alkylation unit and a Sovaformer for catalytic reforming. Engineering on the latter has been completed, and construction is to start early in 1955. Engineering on the alkylation unit is currently under way.

Crude oil for the original Altona refinery was obtained from Venezuela, and in 1950 suitable crude was obtained from the new Klamono field in New Guinea. Crude for the expanded refinery will come from the Middle East and from the Wasian-Mogoi area of New Guinea.

The Altona refinery covers 300 acres on a level site nearly 5 miles from the deep-water port at Williamstown. One of the docks at the port has been reconstructed, and some transit tankage built to facilitate rapid tanker turnaround. Crude is moved to the plant through an 18-in. line. The port facilities permit tankers to discharge at a rate of 7,000 bbl. per hour. It is planned to use supertankers to supply Altona.

Anglo-Iranian . . . The Kwinana refinery is on what was once an isolated stretch of beach on Cockburn Sound south of Fremantle, in western Australia. It is the largest of the new Australian refineries. It is estimated that the refinery, complete with auxiliary facilities such as housing and docks, will cost the equivalent of about $150,000,000.

The Anglo-Iranian Oil Co., Ltd., refinery was designed by M. W. Kellogg Co., and its construction has been supervised by Kellogg International Corp. The operating company is Australian Petroleum Refinery, Ltd.

Capacity of the refinery will be about 70,000 bbl. per stream day. Its output is expected to average about 60,000 bbl. per calendar day.

The plant is scheduled to be commissioned early next year. The first tanker carrying crude is due to berth at the refinery jetty in Cockburn Sound early in January. D. W. K. Barker, manager of the Australasian division in Anglo-Iranian's refineries department, and a member of the original party which selected the Kwinana site, has arrived in Australia to supervise the commissioning.

The Kwinana refinery will have a capacity of 24,000 bbl. per stream day in vacuum distillation. Other process facilities include a fluid catalytic cracking unit with a stream-day capacity of 12,500 bbl. and a 6,000-bbl. per day Platforming unit.

Products will be pumped to Fremantle through two pipelines. One will be a 12-in. line 15 miles long to carry fuel oil for bunkers, and the other will be a 6-in. system 17 miles long for light products.

Surveys for an Australian refinery were undertaken by Anglo-Iranian in 1951, shortly after the company lost its Iranian properties, including the 525,000-bbl. Abadan refinery. At that time, Anglo-Iranian and the Australian Government were partners in Commonwealth Oil Refineries, Ltd., which operated a small plant in eastern Australia. Anglo-Iranian later bought the government's share in this company, which handles the Australian marketing operations.

Caltex . . . The Kurnell refinery on Botany Bay about 20 miles south of Sydney is approximately 50 per cent completed, according to a recent announcement by the Caltex organization. The refinery site is only a short distance from where Captain Cook first set foot on Australia in 1770.

The new Caltex refinery is due for completion the middle of next year. It is designed to process about 22,000 bbl. of crude oil daily into a full line of major products. The operating company is Australian Oil Refining, Ltd. Total capital investment is estimated at the equivalent of $47,000,000. Main contract is held by E. B. Badger & Sons, Ltd.

Process facilities provide 13,900 bbl. per calendar day capacity in vacuum distillation, a similar capacity in catalytic cracking, and 1,435 bbl. per calendar day in catalytic polymerization. There also is a propane decarbonization unit.

Preparation of the marine facilities for the refinery was a major engineering job, requiring dredging millions of yards of sand. The wharf and swinging

basin will be able to accommodate the largest tankers afloat.

The Kurnell plant will be the second refining interest in Australia for the Caltex organization, which has available a large part of the crude production of Arabian American Oil Co. in Saudi Arabia. Caltex now holds 40 per cent interest, paid for by the supply of crude oil, in Bitumen & Oil Refineries (Australia) Ltd. This company operates a 6,500-bbl. refinery on the east shore of Botany Bay near Sydney. The plant was opened in 1948.

Japan Seeks More Oil

Agency proposes 5-year program under which government would finance search for domestic-crude reserves

BECAUSE oil imports take a large part of the responsibility for Japan's unbalanced foreign trade, the government is getting ready to pour large sums into more intensive exploration of the country's own meager prospects.

A program drawn up by Ministry of International Trade and Industry outlines a 5-year plan of exploration as well as development drilling and secondary recovery in existing fields.

The ministry's program provides for letting the country's oil consumers finance the attempt to develop a more significant domestic crude output. The mechanism is a proposed 10 per cent import duty on petroleum products starting with the beginning of the Japanese fiscal year next April 1. It is expected that the tax will produce between $15,000,000 and $18,000,000 annually.

Even at its peak in 1939, Japanese oil production was less than 7,300 bbl. daily, and a fast-expanding consumption since the end of World War II has made it even less of a factor in the domestic oil picture. Virtually all the production comes from small fields in northwestern Honshu, and around 97 per cent of the current output of about 6,000 bbl. daily is produced by Teikoku Oil Co., Ltd.

Prospects doubtful . . . The Japanese program calls for increasing domestic production to the record high of 17,300 bbl. daily (1,000,000 kiloliters annually) by 1960. Only widespread exploration will show if it is possible to achieve this production in Japan. Foreign geologists generally consider Japan's basins to offer poor prospects, particularly for large-scale output.

The chances of increasing production were studied after the war by American oil men on loan to the occupation headquarters, but all that could be done was to modernize equipment and methods, institute secondary recovery and conservation measures, and stabilize output at about the current rate.

If the government's program succeeds in reaching the 1960 goal, which would mean tripling present production, the total will still be only a small part of Japanese consumption. During the current year, the Japanese will use an average of about 175,000 bbl. daily of petroleum products, and by 1960 this could easy be 275,000 bbl. daily, depending on how much oil the country can afford to import.

The 17,300-bbl. daily goal in 1960 called for in the ministry's program is the same as the target provided in a Japanese oil exploration and development plan advanced in October 1953 by the Japanese Petroleum Resources Development Council. This group advocated the spending of $28,000,000, of which $15,400,000 would be put up by the government.

Government role . . . The program of the Ministry of International Trade and Industry would bring the government farther into the oil business in Japan through the creation of an Underground Resources Development Corp. This agency, backed by funds from the treasury, would undertake deep drilling and drilling in areas where there has been no exploration by private operators. This apparently means the government would try the long shots which are too risky for private companies.

The largest sum of money, $26,000,000, would be spent in drilling 184 wells to extend production in existing fields. Most of Japan's crude oil now comes from numerous wells producing only a few barrels daily.

Another $25,000,000 would be spent in drilling 2,070,000 ft. in exploratory wells during the 5-year period. The industry estimated that this work if successful would uncover 8,000,000 kiloliters, or some 50,000,000 bbl. of oil. Present Japanese crude reserves are estimated at around 30,000,000 bbl. The ministry said secondary recovery operations would be carried out over a total of 575,000 acres with the aim of adding 9,700,000 bbl. to reserves.

The subsidy device to encourage oil production also is provided for in the ministry's program. Under this scheme, the government would foot part of the bill for drilling or secondary recovery. For the first year of the program, this would be 65 per cent. It would dwindle to 45 per cent in the fifth year.

Japan's economy . . . If the ministry's program is successful in producing the additional oil, it would save about $21,000,000 in foreign currency during the 5 years and another $12,000,000 annually thereafter.

The Japanese economy has been sustained since the end of World War II largely by American aid in one form or another, and the ending of the Korean war with its heavy expenditures in Japan was a blow to the country's exchange position. During the first half of 1954, Japan ran up a $140,000,000 trading deficit. Japan's position in sterling has been equally bad.

Japan's trade and currency situation explains not only the new ministry's program for increasing oil production but also such other developments as the purchases by independent Japanese interests of oil from Iran, dickering by various Japanese companies for oil supplies from Russia, and the interest of another Japanese operator in the North Borneo properties of Royal Dutch-Shell.

World's Tallest?

A 200-ft. column, possibly the tallest of its kind in the world, goes up at Shell's Stanlow refinery in England. The new column will be a principal column of the refinery's $1,400,000 isopentane plant now under construction. Production of this product will replace imports of this aviation-gasoline component.

Iranian Oil Claims Dropped

With the Iranian nationalization dispute settled, Anglo-Iranian Oil Co., Ltd., has dropped its suit against the

Japanese distributing company, Idemitsu Oil Co., which imported oil from Iran before the settlement.

A Japanese court in Toyko approved Anglo-Iranian's application for withdrawal of the case.

During the more than 3 years the nationalization dispute was pending, Anglo-Iranian pressed its claim to any oil exported on grounds there had been no proper compensation for its properties. The recent settlement agreement gives Anglo-Iranian some $670,000,000 plus a 40 per cent interest in the eight-company consortium.

Before the settlement, Anglo-Iranian sued the three firms exporting Iranian oil in courts in Italy and Japan. A 1952 case was decided in Aden where a British court ruled in favor of the company and turned over to it the first cargo exported by an Italian firm. In Italy, however, the court decided against the company in its claim. The Japanese court earlier had denied the company's request for an injunction which would have prevented Idemitsu from selling the oil.

Plant To Use Gas

Output of Colombian fields to go to fertilizer works

THE Colombian Government is backing construction of a nitrogen-fertilizer plant which will utilize now-wasted gas from the El Centro fields in the mid-Magdalena Valley.

The Colombian development corporation, Instituto de Fomento Industrial, has awarded the contract for design, engineering, and construction to the Montecatini company, the leading chemical producer in Italy. Montecatini's bid was accepted over those of seven other firms, including several United States companies.

It will require about 3 years to complete the project. Cost is estimated at $12,000,000, of which $7,000,000 will be required in dollar exchange for payment of certain equipment and services.

Plans call for a daily production of 50 tons of synthetic ammonia, 150 tons of nitric acid, 65 tons of ammonium nitrate, and 35 tons of urea. The Montecatini Fauser process will be used. The plant will be located on the Magdalena River near the newly expanded Barrancabermeja refinery and will use about 5,000,000 cu. ft. of natural gas from the El Centro field. The fields have been owned and operated by the government company, Empresa Colombiana del Petroleo, since the expiration of the old De Mares concession 3 years ago.

Joint ownership . . . The undertaking will be operated by an autonomous corporation known as Industria Colombiana de Fertilizantes, S.A. Stockholders are the national government, the Federation of Coffee Growers, the Development Corp., E.C.P. (The government oil company), and the Farmbank.

Chemical Construction Corp., (American Cyanamid), made studies of a fertilizer plant in Colombia beginning in 1950. Since then, increasing fertilizer use in Colombia has made it necessary to enlarge considerably the capacity of the project. Fertilizer sales of Farmbank, the country's leading distributor, rose from 11,000 metric tons in 1947 to 38,000 tons in 1953.

Other studies . . . Nitrogen-fertilizer plants have been under study in several other oil-producing countries. Early this year the Saudi Arabian Government asked for bids for construction of an ammonium sulfate and dry-ice plant to utilize gas produced by Arabian American Oil Co.

Bavarian Test Hits

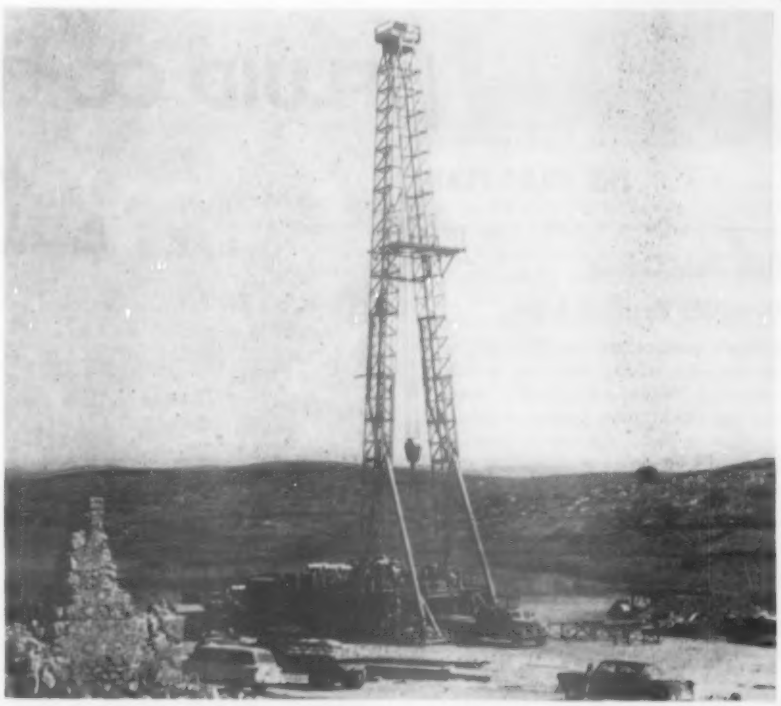
Southern Germany well produces 18°-gravity crude

ANOTHER oil discovery has been made in Bavaria in southern Germany by Deutsche Vacuum Oel and Bayerische Mineral-Industrie, A.G.

Isen 2, drilled about 1.8 miles east of the gas discovery, Isen 1, near the village of St. Wolfgang, was swabbed for about 60 bbl. in 10 hours. The crude is relatively heavy, about 18° gravity.

The crude was obtained between 6,557 and 6,600 ft. from the Lithothamnia limestone near the base of the Tertiary.

Second well was completed in earlier Bavarian oil field of Ampfing. Ampfing 5, drilled 3,000 ft. west of the oil discovery, No. 4, tested 100 bbl. daily through a 1/8-in. choke from basal Tertiary sands at 5,953-96 ft. The crude is about 20° gravity.

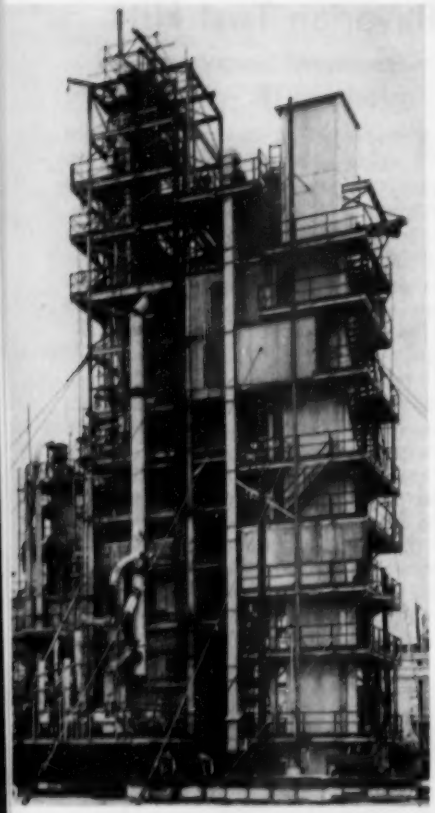


Pace Stepped Up In Israeli Exploration

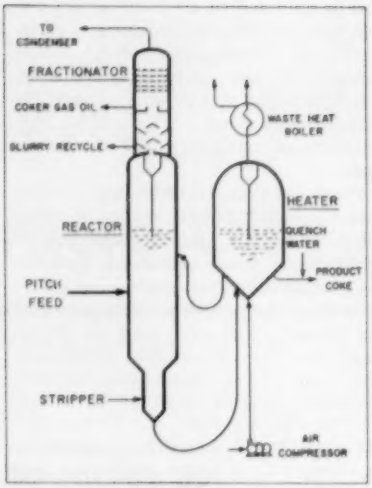
EXPLORATION by the group of independent companies holding acreage in Israel has moved into high gear.

One of the three wells being drilled (above) is the Tel-es-Safi test on a location outlined by gravity and core-hole work 26 miles west of Jerusalem. It is being drilled by Tri-Continent Drilling Co., Inc., a wholly owned subsidiary of Pantepec Oil Co., on acreage jointly owned by Israel-Mediterranean Petroleum, Inc., and Pan Israel Oil Co., Inc. The Ideco H-711 rig spudded the hole October 10. The well is projected to go into the Jurassic to about 7,500 ft.

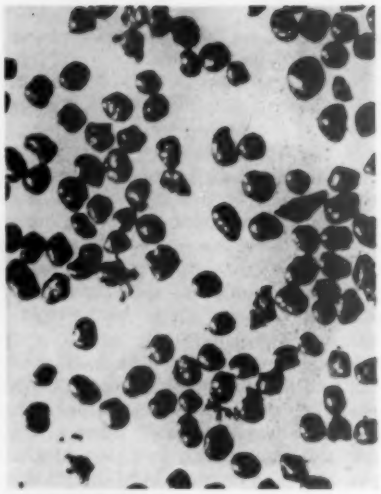
Other wildcats under way in Israel are the Lapidoth well at Beeri. This test is below 9,000 ft. and reported to have had shows. The Pontiac Petroleum test south of Haifa is below 2,700 ft.



...THE PILOT PLANT



THE FLOW PLAN...



THE PRODUCT...

FLUID COKING YIELDS

from 10 residuum stocks

by F. B. Johnson and R. G. Wood

FLUID coking was first disclosed in an article presented before the A.P.I. national meeting in Chicago in November 1953.[1] This first presentation included information on three feed stocks, namely, South Louisiana, Hawkins, and Elk basin. A later publication[2] included some additional information on other feed stocks from Louisiana - Arkansas crude and from California crude.

This article includes coking information on 10 residuum stocks which cover a wide range of feed-stock quality. A comparison with commercial-plant delayed coking is included on atmospheric residuum. The fluid process was easily adapted to operation on all of these stocks, and with proper adjustment of operating conditions it can handle any oil that can be pumped into the reactor. Of course, different stocks will give different results and the effect of Conradson carbon is particularly important.

Process and equipment . . . Basically, the fluid-coking unit consists of a reactor or coking vessel, a heater vessel, and the attendant transfer lines. The coke is circulated between these vessels and product coke is deposited on the circulating coke particles which are allowed to grow to the size of ordinary fine sand.

Feed is injected into the fluid bed of hot coke in the reactor. Heat is supplied to the process by burning a portion of the product coke in the burner vessel or by burning an extraneous fuel in this vessel if all of the coke is desired for other uses.

The feed stock need not be heated beyond the temperature at which it is normally available from crude distillation (500° to 700° F.). Actually the feed may be used at any temperature at which it can be pumped. The difference in feed preheat merely changes the heat load on the fluid-coking system. The operating pressure is essentially atmospheric but may be higher if desired. The temperature of the fluid-coking reactor bed is in the range of 900° to 1,050° F.

Excellent mixing takes place in the fluidized bed in the reactor and the temperature is controlled by adjustment of

Authors are with Esso Standard Oil Co., Baton Rouge, La. From paper presented at W.P.R.A. meeting, September 24, Casper, Wyo.

How Fluid Coking Upgrades Residual Stock

Editor's note: Data on fluid-coking 10 residuum stocks, covering a wide range of feed-stock quality, show that the fluid coking process is easily adapted to operation on any residuum stock. In fact, the authors say, the process can handle any oil that can be pumped into the reactor.

Results from the tests show:

- On all stocks, coke production varied according to the Conradson carbon of the feed and was much less than that obtained by delayed coking.
- The fluid process yields much more gas oil, less naphtha, and somewhat less gas than does the delayed coking process.
- Gasoline from fluid coking has an appreciably higher octane number than that from delayed coking.
- Yields on fluid coking atmospheric residua are rather close to those from a combination of vacuum distillation and fluid coking of the vacuum residuum. This indicates that heavy gas oils can be taken overhead in a fluid coker with little degradation.

TABLE 1—FLUID-COKING YIELDS AND PRODUCT QUALITY

Crude source of feed—	Vacuum residua				Atmospheric residua			Los Angeles Basin residual stocks		
	So. La. mixture	Mixed Calif.	Hawkins	Tex. Panhandle	Zaca	Casabe plus mixed coastal	So. La. mixture	Virgin pitch	Asphalt	Visbreaker Tar
Feed inspections:										
Gravity, °A.P.I.	13.2	5.6	4.2	17.3	4.7	15.1	17.7	6.7	—0.2	—3.5
Conradson carbon, weight per cent	14	22.5	24	11	19	9	5	17	33	41
Pour point, °F.	120+	120+	120+	85	120+	55	100	120+	120+	120+
Sulfur, weight per cent	0.9	1.7	4.3	0.7	7.8	1.2	0.5	2.0	2.3	2.1
Nitrogen, weight per cent	0.33	1.2	0.28	0.32	0.70	0.40	0.20	1.4	1.9	2.1
Viscosity, S.s.F. at 275° F.	67	317	406	28	277	42 (210)	154 (150)	106	Too heavy	
Carbon, weight per cent	87.3	86.1	85.1	86.9	80.2	86.6	87.4	85.5	85.8	86.9
Hydrogen, weight per cent	11.5	10.1	10.1	12.4	10.1	11.3	12.4	10.5	9.3	8.8
H/C atomic ratio	1.57	1.41	1.41	1.71	1.50	1.56	1.70	1.47	1.30	1.20
Per cent distilled at 1,000° F.	0	10	10	0	35	55	40	25	0	5
°F. at 5 per cent distilled		979	966		735	692	819	844		1,000
Volume per cent on crude	4		29	13	65		9	40		
Ultimate yields on coker feed:										
C_3, weight per cent	8	8	9.5	7	8	5.5	6	8	10	11.5
C_4, volume per cent	2.5	2.2	3.5	2	2.5	1.5	2	2.5	3	3
C_5-430° F., volume per cent	21.5	19.3	19.5	21	20.5	13	17	16.5	17.5	14.5
430/1,015° F., volume per cent	61	55	52	68.5	61	75	74	61.5	44.5	32.5
Coke, weight per cent (gross)	16	26	27.5	11.5	17.5	11	8	20.5	36	48.5
Products quality:										
Naphtha										
Research octane number, clear	73	76	77	66	82	76	73	80	82	
Sulfur, weight per cent	0.2	0.6	0.9	0.2	4.6	0.3	0.1	1.3	1.7	0.8
Gravity, °A.P.I.	56	55	56	59	49	55	56	55	54	55
Gas oil										
Gravity, °A.P.I.	22	16	17	29	14	21	24	17	14	15
Sulfur, weight per cent	0.5	1.2	3.7	0.4	6.2	1.4	0.4	1.7	2.2	1.7
Characterization factor	11.55	11.30	11.17	11.98	10.90	11.59	11.81	11.28	10.97	11.01
Conradson carbon, weight per cent	2.1	3.3	2.8	1.2	2.3	1.1	0.8	2.0	3.1	1.6
Nitrogen, weight per cent	0.20	0.87	0.12	0.15	0.41	0.23	0.13	0.81	1.1	1.1
°F. at 50 per cent distilled	787	800	780	780	776	825	847	822	780	793

circulation rate and the temperature used in the burner vessel. The products from the coking process pass through a fractionating tower and the gas, gasoline, and gas-oil fractions separated are then directed toward normal refinery handling processes.

The equipment used in the pilot-plant studies included a 100-bbl. per day fluid-coking pilot plant, which has been previously described,[1] and a 0.1-bbl. per day fluid unit which has been found to give excellent results in comparison with the 100-bbl. per day plant. Accordingly, yield predictions suitable for studying commercial application of the process can be based on the small-unit data.

Comparison of Feed Stocks

The feed stocks used in the fluid-coking studies include heavy vacuum residua, atmospheric residua, asphalts, and thermally cracked residua. Table 1 indicates typical data on four vacuum residua which vary in quality from a highly paraffinic Texas Panhandle stock to a high-sulfur Hawkins residuum and a moderate sulfur, high-nitrogen mixed California stock. The results are typical for these types of residuum feeds.

Coke production varied according to the Conradson carbon of the feed, and sulfur content of the liquid products varied with the sulfur in the feed.

Table 1 also presents data on three atmospheric residua: Zaca; Casabe (Colombia); plus mixed Coastal and South Louisiana crude products.

These data show higher gas-oil yields than were obtained from vacuum residua. This was expected since the feed stocks contained from 35 to 55 per cent of material boiling below 1,000° F. Coke make was related to Conradson carbon, as in the previous comparison. Product quality, as regards sulfur and gravity, varied with sulfur and gravity inspections on the feed.

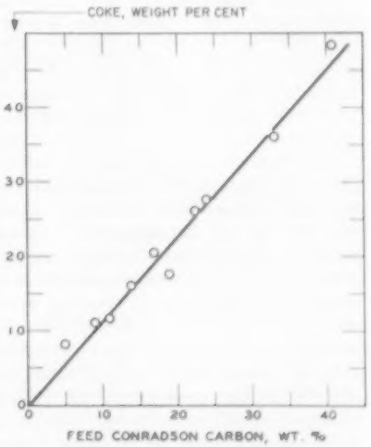


Fig. 1—Fluid coking of residue.

A comparison of data on long and short residua indicates that the yields on fluid coking of atmospheric residua are rather close to those from a combination of vacuum distillation and fluid coking of the vacuum residuum. This indicates that heavy gas oils can be taken overhead in a fluid coker with little degradation. The choice of feed stocks will depend on the availability of equipment in a given refinery and economic considerations on the costs of new equipment.

Table 1 further shows a comparison of three Los Angeles Basin residual stocks which include: (1) a virgin residuum; (2) an asphalt obtained from this residuum by solvent deasphalting; and (3) a visbreaker tar from the same crude source.

Here again the data tie in well with feed-stock quality. In this case, the original virgin residuum contained some gas oil and this was reflected in the ultimate yields.

Fig. 1 is a plot of Conradson carbon versus ultimate yield of coke from the feed stocks discussed earlier. The correlation is very satisfactory. Since the coke is directly proportional to Conradson carbon, the yield of other products will obviously vary inversely with Conradson carbon. However, the gas yields do not change appreciably with

changes in feed quality, and therefore most of the variation in yields shows up in the liquid products.

Comparison With Delayed Coking

The fluid-coking process differs from the delayed-coking process[3] in a number of ways. Primarily, the delayed-coking process involves depositing the coke in large drums or soaking vessels followed by removal of the coke from these vessels at roughly 24-hour intervals. Generally, two coke drums are available and these are alternated between coking and cleaning operations. In the fluid process, the coke is continuously circulated in the system and coke make is withdrawn continuously.

Table 2 shows results of fluid and delayed coking of an atmospheric residuum from a mixture of 70 per cent Casabe (Colombia) and 30 per cent mixed coastal crudes. The delayed coking data were obtained in the commercial unit of Pan-Am Southern Corp. at Destrehan, La.[4] The fluid-coking results were derived from pilot-plant operations and are shown in summarized form in Table 1.

This comparison shows the fluid process to produce much less coke, much more gas oil, less naphtha, and somewhat less gas. The coker gas oil from the fluid process is considerably higher boiling than that from delayed coking. Also, the gasoline from fluid coking has an appreciably higher octane number than that from delayed coking. A previous comparison[2] on a California vacuum residuum showed similar results. Handling of vacuum residua in delayed coking has raised a number of operating problems which appear to make commercial application of this type of operation unattractive. Therefore, delayed coking is usually applied to atmospheric residua only.

Quality of Coker Gas Oil

In general, the gas oil obtained from either fluid coking or delayed coking is a satisfactory feed stock for catalytic cracking. The fluid-coker gas-oil quality will vary depending on the quality of the feed stock. The sulfur content of the gas oil follows the sulfur content of the feed, and the characterization factor will vary depending on the feed stock used. For example, the characterization factor of gas oil from Texas Panhandle residuum had a value of 11.98 whereas the product from coking of a visbreaker tar showed a characterization factor of 11.01. The gas oil from South Louisiana residuum coking had a sulfur content of 0.5 per cent, whereas that from Hawkins residuum contained 3.7 per cent sulfur. It is apparent that improvements in coker gas oil can be obtained by mild hydrodesulfurization if this should be necessary to fit in with a definite refinery situation. The cut point chosen in fluid coking will vary depending on the type of catalytic cracking capacity available and the type of feed stock used. The problems involved are similar to those in distillation of crude and are not peculiar to the fluid-coking process. Coker gas oils are understandably of poorer quality than virgin gas oils from the standpoint of carbon yields on catalytic cracking. Some economic studies have shown good returns from a combination of processes including cracking a coker gas oil which produced as much as twice the catalytic carbon as a virgin gas oil distilled from the same crude.

TABLE 2

Comparison of Delayed and Fluid Coking Ultimate Yields and Product Quality

	70 per cent Casabe residuum + 30 per cent mixed coastal residuum	
Feed source and inspections:		
Gravity, °A.P.I.	15	
Conradson carbon, wt. per cent	9	
Ash, wt. per cent	0.074	
Sulfur, wt. per cent	1.2	
Distillation:		
5 per cent at °F.	692	
50 per cent at °F.	958	
	Fluid coking‡	Delayed coking§
Yields, per cent on feed:		
C_5-430° F., V.T. naphtha, vol. per cent	13	*22.5
Gas oil, vol. per cent	75	57
C_4, vol. per cent	1.5	2.5
C_3 and lighter, wt. per cent	5.5	6
Coke (total), wt. per cent	11	22
Gas-oil inspections:		
Gravity, °A.P.I.	21	26
Distillation, °F.:		
Initial	470	470
20 per cent	675	565
50 per cent	825	685
80 per cent	925	790
Conradson carbon, wt. per cent	1.1	0.03
Aniline point, °F.	165	154
Nitrogen, wt. per cent	0.23	0.14
Sulfur, wt. per cent	1.4	0.93
Stabilized gasoline inspections:†		
Gravity, °A.P.I.	55	61
Distillation, °F.:		
Initial	120	123
10 per cent	182	172
50 per cent	277	237
90 per cent	373	313
Final boiling point	400	357
Research octane number, clear	76.3	69.9
Bromine number	106	73
Aniline point, °F.	82	112

*Naphtha yields for delayed coking are given on a C_5-430° F. basis as cut in laboratory distillation equipment. †Stabilized gasoline inspection data for delayed coking were obtained on a low end-point gasoline as cut at the Destrehan unit. ‡Esso Laboratories pilot plant. §Destrehan commercial unit.

Coker naphtha quality . . . The gasoline from fluid coking will vary in research clear octane number depending on severity of operation. The sulfur content of the naphtha will vary with the sulfur content of the original residuum. Coker naphthas are thermally cracked products and generally have high gum and low breakdown time.

Where sulfur is low, coker naphtha can generally be blended into a total gasoline pool after a simple clay-treating procedure to improve stability. Where high-sulfur coker naphtha is produced, desulfurization may be required. If Hydrofining[5] is used, other treatments for gum and stability will not be required and a high liquid-volume yield (about 100 per cent) will be realized.

The possibility of using coker gasoline in feed to Hydroforming[6] also appears attractive. In this case as well as in the case of gas-oil quality, the individual refinery situation will control the type of treating procedure used.

Coke characteristics . . . The coke produced in fluid coking has some interesting properties. It is expected that some of it may find its way into various specialty uses such as a raw material for the manufacture of electrodes for the aluminum industry. It can also be used as a fuel for combustion burners equipped for handling solid fuels, such as ground coal. The particles are generally round and are in the particle size range of 20 to 100 mesh. There is very little dust present which makes the handling an easy problem.

It has been shown that fluid coke may be transported by pipelines, conveyor belts, or pneumatic carrier devices for intermediate storage and for the handling required in its final disposition. Longer-range moving may be adequately handled by railway cars, barges, and other carriers.

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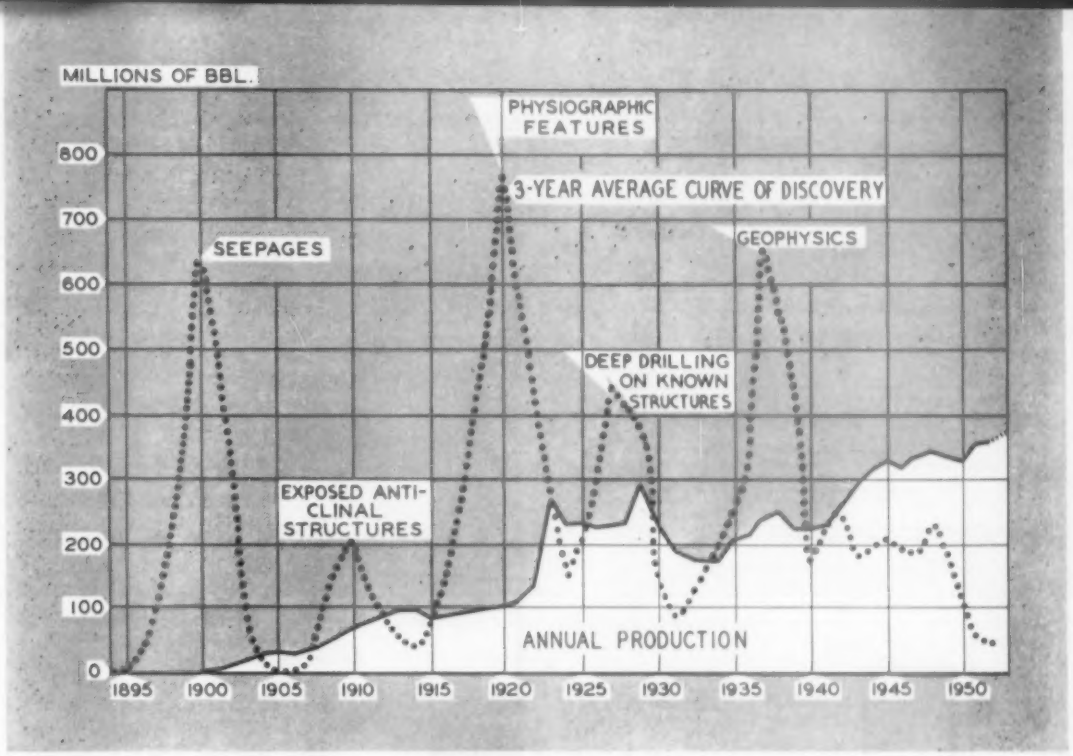
6. The Oil and Gas Journal, 51, 110, 140, 141 (May 19, 1952).



Crude-oil reserves discovered in California are shown in the above figure with the geological reasons for locating the discovery wells indicated.

OIL IN CALIFORNIA, 1946-1953

Six Steps to Greater Reserves

• Enactment of legislation enforcing efficient production methods • Improved recovery techniques • Discovery of pools in and extensions of present fields • Discovery of large fields inshore • Discovery and development of fields offshore • Application of secondary-recovery.

by Graham B. Moody

CALIFORNIA has enjoyed pronounced waves of oil discovery, starting near the end of the nineteenth century, and intervening troughs; very little oil has been discovered in the latter. Forecasts of California's future in oil have followed a definite pattern during the past 50 years: during each wave of discovery the outlook was for ruination of the market by a flood of oil; during each trough the prophecy was that California could never find enough oil to supply its demand and was certainly approaching virtual extinction as a producer of oil.

This article is an analysis of California's exploratory effort and its change in reserves position from January 1, 1946, through 1953. It is believed that an objective presentation of exploration, discovery, and production data may clarify California's present and future position in the oil economy of the nation and may serve to refute some of the alarming published statements on this subject.

The discussion is confined to crude oil even though natural-gas liquids and natural gas constitute an important part of our fuel supply. The trend in discoveries of natural-gas liquids and natural gas does not differ significantly from that for crude oil.

Author is associated with Standard Oil Co. of California, San Francisco. Paper presented before the Pacific section of the American Association of Petroleum Geologists at Los Angeles. Article appeared in Bulletin of the A.A.P.G., September 1954.

Exploratory Results, 1953

California's success factors in its 1953 exploratory effort were about the same as those of the remainder of the United States for new-pool wildcats and outposts but were substantially lower for deeper-pool tests (37.9 per cent for California, 49.5 for other states). California excelled only in shallower-pool tests which were 83.3 per cent successful compared with 14.4 per cent success for other states. Shallower-pool tests constituted 1 per cent of total exploratory wells.

New-field wildcats (NFW) are not only the most hazardous but also the most significant of all exploratory holes. A successful new-field wildcat finds production on a previously nonproductive structure and offers the opportunity of drilling new-pool wildcats (NPW), deeper-pool tests (DPT), shallower-pool tests (SPT), and outposts (OP) on that structure. California in 1953 drilled practically the same percentage of new-field wildcats (51.9) as did all other states (52.0).

It should be noted that, although new-field wildcats are rated most significant, other types of exploratory holes

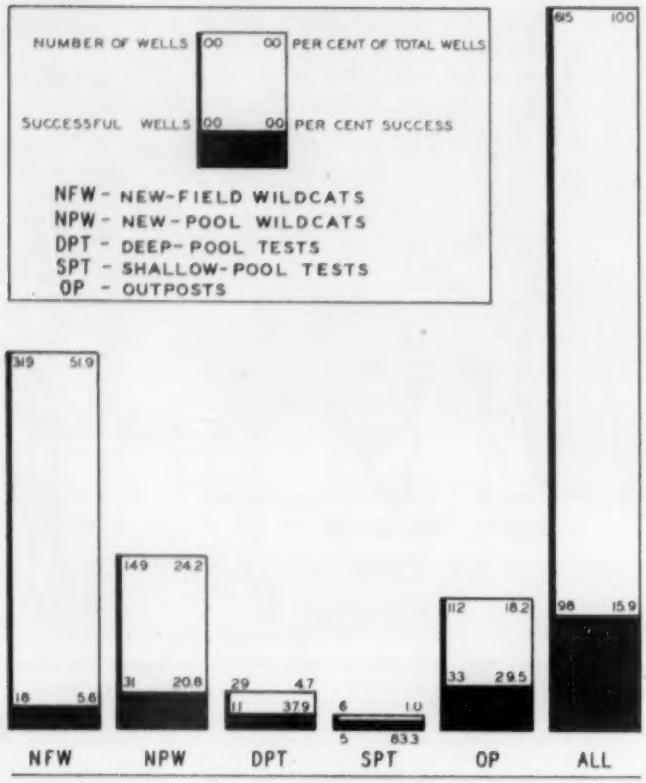


Fig. 1—Classification of California exploratory wells in 1953 shows that 1 out of every 6 tests was successful; only 1 out of every 18 resulted in the discovery of a new field.

may increase a state's reserves more than do new fields discovered in any 1 year or over a period of several years. This seemingly paradoxical situation is due to the fact that new pools in or extensions of old big fields, particularly during recent years in some states, have been frequently far more prolific producers than the small new fields discovered.

California drilled only 4.8 per cent of all exploratory holes and 4.8 per cent of new-field wildcats in the United States during 1953, whereas it accounted for nearly 16 per cent of the nation's crude output. These comparative percentages suggest that California is not assuming its proportionate share of the national exploratory effort or is running short of attractive locations for prospect drilling or its operators are diverting an increasing part of their exploratory money to regions where the grass looks greener.

1946 Through 1953

The 8-year records of the 10 states that drilled nearly 83 per cent of all new-field wildcats in the United States were analyzed. The states that enjoyed the highest percentage success were New Mexico with 17.3 and Louisiana with 14.3 per cent, but these two drilled only 1.9 and 5.5 per cent, respectively, of all new-field wildcats. Texas rated third in success factor, 13.5 per cent, but accounted for 41.3 per cent of all new-field wildcatting. California had the lowest success factor of the 10 states, 4.5 per cent, and drilled only 5.5 per cent of the new-field wildcats.

The success factors mentioned above refer to all new-field wildcats drilled irrespective of the basis for locating them. Actually, these holes are classified into three groups—technical (geology and/or geophysics) locations, nontechnical locations, and those located for reasons unknown. Technically located new-field wildcats during this 8-year period were 12.4 per cent successful, whereas those nontechnically located were only 3.5 per cent successful or, in other words, the former were 3.5 times as successful as the latter.

The success factor for new-field and new-pool tests combined is higher normally than for new-field wildcats alone. Examples of this are California where success factor for new-field and new-pool tests was 2.2 times greater than for new-field wildcats alone and Texas where the analogous figure is 1.35. Illinois, however, was almost as successful in new-field wildcatting, 9.9 per cent, as in its total new-field and new-pool drilling, 10.0 per cent. This apparently anomalous situation may be due to the criteria used in classifying the exploratory holes in Illinois.

Eight of the ten states drilled a smaller percentage of total new-field and new-pool tests than they did of total new-field wildcats alone. This indicates that these eight states are concentrating more heavily on the most hazardous ventures (new-field wildcats) than are some other states, for example, Kansas and Oklahoma. There are, of course, several nonproducing states wherein all exploratory wells are new-field wildcats.

Exploration vs. Discovery

The success factor discussed in preceding paragraphs serves as a gage of the accuracy of the geological thinking that reached the conclusion: "structural, stratigraphic, and lithologic conditions are favorable for the accumulation of oil at this location." Perhaps a better term would be "accuracy" factor or "proof-of-reasoning" factor because the amount of oil discovered by the successful wells is not reflected in the factor and, after all, the real success of exploration is determined by the total barrels of oil found. A successful well that discovers a few thousand barrels of oil has equal weight in the exploratory-success factor with one that discovers 50 million barrels, but not in the balance sheet.

The estimates are made by the American Petroleum Institute's Committee on Petroleum Reserves at the end of each year. Subsequent extensions of the new pools and added knowledge of the reservoir performance will require an increase in the estimates of reserves for those pools and, in consequence, the discovery rate per well drilled.

Exploratory drilling costs are affected by depth of hole. The average depth of these holes in different states during the 8-year period ranged from about 1,800 ft. in Indiana to about 7,900 ft. in Louisiana. California leads the field with 26.1 bbl. per foot, followed by Wyoming (23.2), New Mexico (22.2), Louisiana (19.0), and Texas (17.9). The same five states show highest returns on both per well and per foot calculations but all except Texas have shifted relative positions as shown below:

Barrels Discovered

Per well drilled	Per foot drilled
1. Louisiana	California
2. New Mexico	Wyoming
3. Wyoming	New Mexico
4. California	Louisiana
5. Texas	Texas

Exploration's final contribution to the bank account cannot be gaged from the amount of oil discovered either per hole or per foot drilled. The cost per foot of drilling varies not only with depth but also with character of

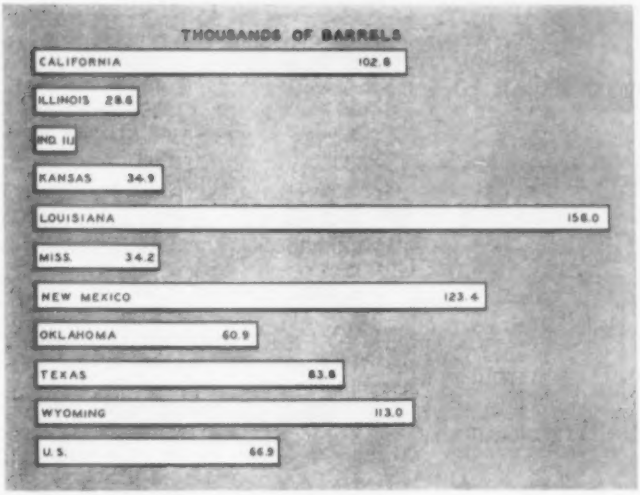


Fig. 2—The rewards of exploration are shown above in terms of barrels of crude oil discovered per exploratory test.

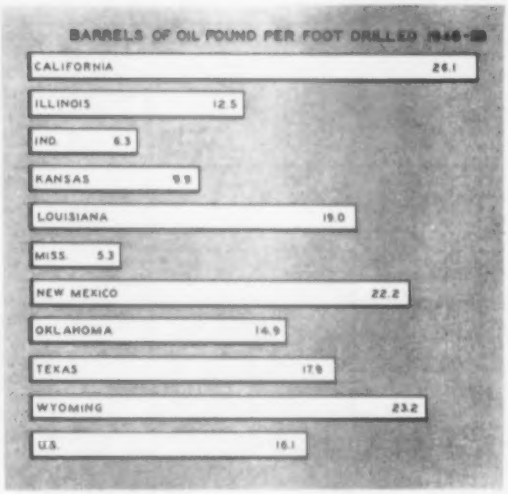


Fig. 3—Exploration success can be measured in terms of barrels of crude oil found per foot of exploratory drilling.

formation penetrated, which modifies the significance of barrels discovered per foot of hole drilled. Other economic factors such as development and producing costs, price of the crude, accessibility to markets, must be written into the equation in comparing the net returns from exploration in various states or, obviously, in different basins in the same states.

Discovery vs. Production

Seven states recorded 90 per cent of all oil discovered and 90 per cent of total additions to oil reserves during the 8-year period and on December 31, 1953, were credited with almost 92 per cent of total crude-oil reserves in the United States.

Oil added by new discoveries replaced 25 per cent of total withdrawals in the United States. Louisiana topped the other six states with its discoveries amounting to 33 per cent of its production. California replaced by discovery only 12 per cent of the amount that it produced.

The addition to reserves by extension and revision is not attributable entirely to exploratory drilling. Some pools are extended by stepout development wells instead of by outposts (exploratory holes). Revisions to former estimates, furthermore, may be due to in-fill development drilling or, on the other hand, may be due to improved reservoir performance indicating greater ultimate recovery not related to any drilling activity.

A considerable part of additions by extension and revision during the period of 8 years, however, is credited to exploratory drilling during that period. The writer, therefore, prefers to relate total additions to reserves to total exploratory drilling rather than to total dry holes drilled (both exploratory and development), as has been done by some analysts.

Large Fields

Dr. F. H. Lahee published a study* of the number of new-field wildcats drilled in the United States to find fields of varying ultimate recovery during the 3-year period, 1944 to 1946. He grouped fields by size as follows: greater than 50 million barrels, 25 to 50 million, 10 to 25 million, etc. His annual articles on 1950, 1951, and 1952 exploratory drilling give revised figures for the years 1944 through 1949.

During the period 1944-1946, the industry drilled 744 new-field wildcats to find one field with ultimate recovery greater than 50 million barrels and 154 new-field wildcats to find one field with ultimate recovery greater than 10 million barrels. During the following 3-year period, 1947-1949, it required 972 new-field wildcats to find one field larger than 50 million barrels and 212 new-field wildcats to find one field larger than 10 million barrels.

California drilled during the first 3-year period, 1944-1946, 616 new-field wildcats and found 5 fields greater than 10 million, none greater than 50 million barrels; during the period 1947-1949 drilled 760 new-field wildcats and found 6 larger than 10 million and 3 larger than 50 million barrels.

This comparison may be summarized as follows: California did not drill enough new-field wildcats from 1944-1946 (according to the average for 17 states) to find a single field larger than 50 million, but required only 123 new-field wildcats for each field larger than 10 million barrels. During the 1947-1949 period, California drilled only 253 new-field wildcats for each field over 50 million and 125 new-field wildcats for each field over 10 million barrels.

Comparative figures for the 6-year period, 1944-1949, are: California 459 new-field wildcats vs. United States 858 new-field wildcats for each field greater than 50 million and California 125 new-field wildcats vs. United States 183 new-field wildcats for each field larger than 10 million barrels.

The rate of discovery may be interpreted most realistically if the current estimate of the ultimate recovery of each pool is credited to its discovery year. This method of presentation penalizes somewhat the most recent years in comparison with earlier years but gives a more correct picture of the trend in exploratory rewards. The writer lacks sufficient data to treat discoveries in all states in this manner but has done it for California.

It is evident that California has enjoyed distinct waves of discovery. George Cunningham and Clark Gester, in 1943, named these waves to indicate the type of exploratory thinking and drilling that was chiefly responsible for the discoveries. Each fresh approach to the problem of finding oil led to a rash of discoveries that soon exhausted the prospects that could be found readily by that particular mode of attack. The intervening lean periods are those during which some new method or a refinement of some old method of locating oil was being developed.

Other prospecting methods were in use during these named discovery eras but the sharp upswings in discoveries can be attributed to specific methods. It is hard to name the period of years following 1940; the writer has called it "Marking Time" or "Reappraisal of Data," but other names might be more

*"Degrees of Success in Wildcat Drilling," Bull. A.A.P.G., V. 35, No. 1, January 1951, p. 138.

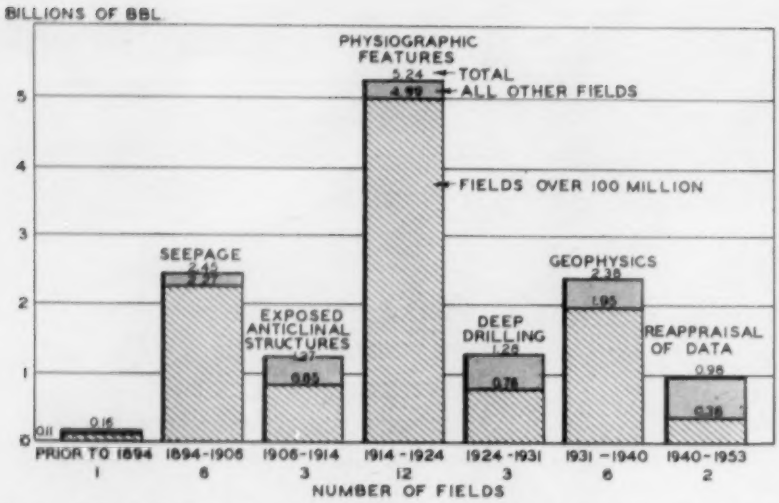


Fig. 4—California fields that have an estimated recovery of more than 100 million barrels of crude each are broken down into the methods leading to their discovery.

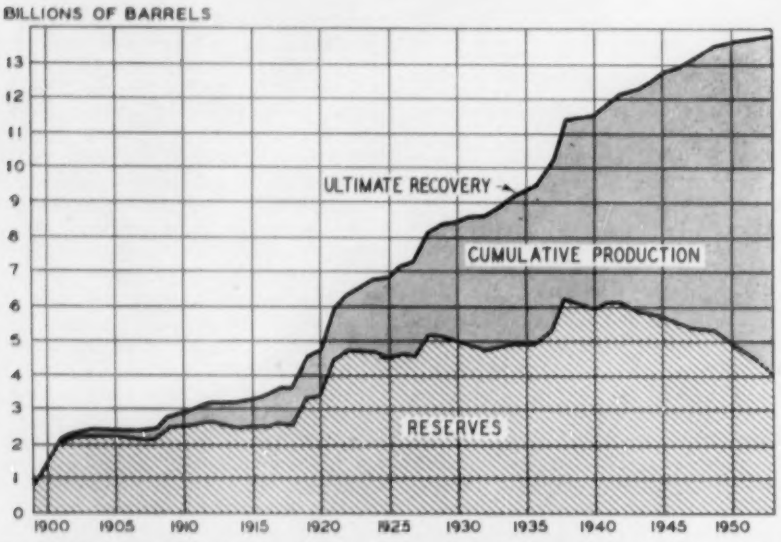


Fig. 5—Graph of California's cumulative production and ultimate recovery indicates that the state's reserves are declining. (Pool reserves are credited to the discovery year.)

descriptive. There are indications in 1942 and again in 1948 that another peak was in the making from reappraisal of data but most of the years since 1940 look more like marking time.

The wave of discovery instigated by the recognition of the significance of physiographic features centered in 1920 with a 3-year average of almost 770 million barrels of oil discovered annually. Santa Fe Springs, Huntington Beach, and Long Beach, are outstanding fields discovered in that era.

California's 33 Big Wheels

The success of any endeavor (committee, company, or industry) often depends largely on the efforts of a small percentage of those involved. This is true in some degree of the oil industry in California. The 33 "big wheels" that are largely responsible for California's important contribution to the oil industry merit some discussion.

There are 33 fields in California that will make ultimately more than 100 million barrels of oil each. These 33 fields represent 13.5 per cent of all fields found in the state. There were 12 of these big ones discovered during the "Physiographic" cycle of discovery; they found 5¼ billion barrels of oil, or roughly 36 per cent of the total oil found in California to date. Note that only two big ones were discovered from 1941 to date and total discovery during this period was only 1 billion barrels.

The 33 big wheels account for 82 per cent of all crude oil discovered to date, more than 78 per cent of all remaining proved reserves, nearly 84 per cent all crude oil produced to date, and 72 per cent of production in 1953. It merits comment further that the 12 big fields discovered in the physiographic cycle produced 25 per cent of 1953 total production.

Appraisal of California's Reserves

The true status of California's crude-oil reserves on December 31 each year from 1899 through 1953, based on current data, is shown in an accompanying figure. The reserves on December 31 each year are determined by deducting cumulative production to that time from present estimate of the ultimate recovery of all pools then discovered.

It is evident that the peak of California's reserves was in 1938 when the pools then discovered had reserves of approximately 6¼ billion barrels. Current reserves are slightly more than 4 billion barrels. It should be emphasized that it was not known in 1938 that California had 6¼ billion barrels of discovered reserves. Many pools then produced were only partly developed. Long extensions since 1938 of those pools and the remarkable reservoir performance of many of them could not have been forecast at that time, but have resulted in great increases in the estimates of reserves discovered prior to that time.

It scarcely needs comment that the reserves curve indicates that California's reserves have declined continuously since 1942, if current estimates of ultimate recoveries are credited to discovery years.

Conclusion

Evident conclusions to be drawn from the foregoing discussion and figures are:

1. The California oil industry has done a remarkable job in finding and developing the state's oil resources and will continue to astonish, perhaps dumbfound, those who forecast its early decline to senility.

2. California attained its peak discovery rate 33 years ago.

3. California's reserves reached highest point in 1938.

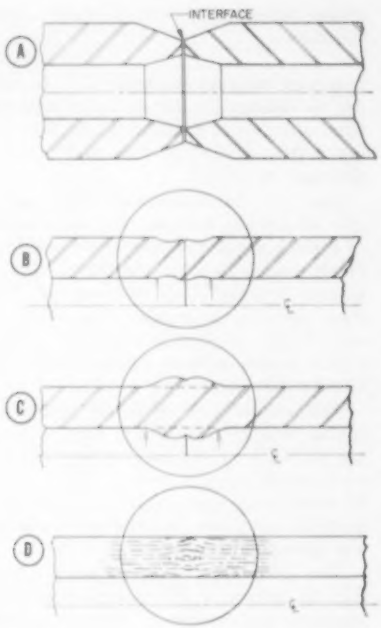
4. The health of our oil economy has been dependent largely on the performance of the 33 big wheels.

5. We have failed in the past to recognize the potentialities of our largest fields.

6. It is probable that we do not realize yet how much oil will be recovered ultimately from present big fields.

7. New small fields that are discovered fall far short of replacing our annual production—over 365 million barrels in 1953.

8. It is essential that we find more big fields—those in the big-wheel class.



Drill collar and stub are machined to the contour at A and inserted in a horizontal press. Heat and pressure between the pieces causes forging to upset and bond the metal as at B. As area of welding grows, more heat and pressure are necessary to produce the final weld at C. After cooling and normalizing, the upset is machined to the regular diameter at D. Fig. 1.

Pressure-Weld Technique for Stub-Ending Drill Collars

by J. L. Dickmann

UNDOUBTEDLY, the most notable evidence verifying the capabilities of a pressure-welded drill collar is the actual performance under field conditions. Over the past few years, thousands of collars have been repaired in this manner and have rendered entirely satisfactory service under the most rigorous of drilling conditions.

Consequently, the drilling industry, in general, is now accustomed to accepting the "stub ending" of drill collars by such a reliable method.

Engineers believe the pressure-welding technique to be a superior method of welding for the following reasons:

1. The material at the weld is completely homogeneous, resembling the base metal in all respects, since no filler metal has been added. There is a definite absence of any slag inclusions, gas pockets, hard spots, or other undesirable elements.

2. Since the weld is performed at a relatively low temperature compared to other methods, grain growth is reduced to a minimum, hence improved material strength.

3. The additional working of the metal during the upsetting phase produces an extremely desirable structure across the weld.

4. Mild heat is applied evenly to the product, and consequently a minimum of internal stresses are developed.

5. The process is equally adaptable to welding high or low hardenability steels of varying carbon or alloying content, with the weld characterizing a mean of the individual metals.

However, it hasn't been too many years in the past that the bare suggestion of repairing highly stressed members of drilling equipment by means of welding would cause the average drilling superintendent or equipment engineer to shy like a horse trying to avoid a rattlesnake. Their feelings were undoubtedly justified by numerous weld failures—welds which were improperly formed by inexperienced operators using unsound welding practices, or were unaware of the materials with which they were working. Quite possibly no post heat treatment was applied to the part to relieve the stresses or undesirable grain structure induced during welding.

Author is chief engineer, Baash-Ross Tool Co., Los Angeles. Paper presented at petroleum-mechanical conference of A.S.M.E., Los Angeles, September 29, 1954.

Now accepted practice . . . The present-day oil-drilling industry has not only grown to accept the weld as a valuable asset to its operations, but in many cases to prefer it to other means of connecting various members. Among these, the repair of drill collars by means of welding a short section or stub to one or both ends has become a common procedure.

The so-called "stub ending" of drill collars probably first gained prominence in the West Texas area where as many as 18 to 28 collars were employed in the drill string. Consequently these collars formed an appreciable percentage of the over-all equipment cost, and any economies which could be effected toward the repair or salvage of the used collars would realize a sizable saving.

It was found that proper stub ending could satisfactorily accomplish any of the following desirable repairs:

1. **Restore a worn collar to original outside diameter.** The added stub diameter at the ends furnished an increased stabilizing effect at the connection and also permitted the operator the continued use of the original size tool joint. Restoration of the original box strength of the connection was of particular importance in West Texas, since a prevailing corresion-fatigue condition contributed to numerous box failures in this area.

2. **Restore a short collar to original length.** Some operators were not interested in maintaining the original diameter of their drill collars but preferred transferring worn collars to service in the next smaller size of hole drilled. By the time a collar has worn ½ to ¾ in. on the diameter, it has probably been recut many times and is perhaps 2 or 3 ft. short of the original length. Stub ending will return the collar to its original length, eliminating the need for extra-long handling subs to place the stand in a convenient position at the fourble board.

3. **Maintain proper pin strength.** A third example for stub ending might be occasioned when an operator desires to use a string of originally 6¼-in. o.d. collars with 3-in. bore, now worn to 5¾-in. o.d. He desires to maintain proper joint balance and strength which would possibly indicate cutting a 4½-in. regular or similar joint on this size collar. However, the present 3-in. bore prohibits cutting either of these joints since a weak pin would be the result. Welding a stub having a 2 or 2¼-in. bore at the lower end of each collar to accommodate the pin will provide the required strength.

4. **Additional material strength.** Another application for stub ending would exist in the case of a collar in which the proper physical properties could not be developed for proper joint strength. The addition of a stub having adequate alloy content and harden-

ability would satisfactorily rectify this situation.

Types of welding available . . . In order to distinguish the pressure process from other types of welding, the following briefly compares the three classifications of welds:

The first, the **liquid-solid** phase, consists of welding two members by means of a filler metal having a lower melting point than either of the parts to be joined. Brazing is an example of this type whereby a bronze filler rod is melted and bonded to the base metal which is not melted—hence, the term liquid-solid phase.

The second type is **liquid phase** or fusion welding, in which the adjoining surfaces of the base metal in the weld members are melted, either with or without the addition of other molten material. Arc, gas, and thermit welding are all typical examples.

The third type, **solid phase** welding may be defined as the process by which members are bonded by nuclear forces without the presence of a liquid phase at any stage of the process.

Pressure Welding

The process of pressure welding has always seemed somewhat intriguing and mystifying, in that it is a normal concept that metals must be melted to form an effective bond with each other. The fallacies of this belief should become readily apparent with a description of the preliminary preparations and the incidents occurring during the welding cycle. The following description covers the procedures as practiced by one concern for the welding of drill collars and there are definitely other variations for performing pressure welds in sections having other sizes, shapes, and materials.

Briefly, the process consists of forcing the prepared weld members into engagement under hydraulic pressure, applying the proper degree of heat, and upsetting the steel bridging the weld section.

First step machining . . . The initial preparation consists of accurately machining both the drill collar and the stub to the general contour shown in "A" of Fig. 1. The interface is machined perfectly square with the common axis of the members and finished with an extremely smooth tool finish to exclude the entrapment of oxygen and the subsequent formation of undesirable oxides in the weld itself.

Dimensions and the degree of taper have been omitted, since these values are dependent on the various diameters and bores of collars. Actually, the proportioned amount of final upset on the outer diameter of the collar to the upset in the bore for a given longitudinal displacement is a direct function of the relative degree of bevel. Originally, our present values for these items were developed largely on a trial basis.

Next step into machine . . . Following the machining preparation, both members are clamped in the welding machine. Basically, this machine is a horizontal hydraulic press. The drill collar is held in a hydraulically actuated stationary collet, while the stub member is clamped in an opposing, movable collet of similar design. The traverse of the latter is controlled by two hydraulic pistons operating on a 1,000-psi. system. Both collets or chucking members are mounted in turn on a horizontal bed.

Midway between them, the heating torch is mounted on a carriage resembling that of a lathe. The torch consists of two semicircular members having a multiplicity of flame ports around the inside diameter. It is fueled with oxygen and acetylene and is internally water cooled. All critical structural members of the machine in the vicinity of the torch are also internally water cooled for the preservation of rigidity and accurate alignment.

The machines which we have constructed for this service have a maximum capacity for welding a 9-in. diameter solid bar and are also adaptable to welding other symmetrical sections, such as drum shafts, kellies, etc.

Then, check alignment . . . Prior to welding, the alignment of the interface is checked by taking an impression on a suitable paper. Any necessary adjustments are then made to assure perfect alignment and rechecked with another impression. The operator next sets up the machine, as per drawing specifications. In addition to the drawing having complete machining dimensions for each size of weld, it lists the proper setting of the flow meters controlling the flow of oxygen and acetylene, the size of the heating torch to be used, the amount of axial upset required, the hydraulic **gage** pressures, and the approximate time of the weld. These items have all been predetermined with the intent of gaining uniformity in the end product and reducing the human element to a minimum.

After adjusting these quantities into the setting of the machine, the interface is carefully cleaned with a suitable solvent, such as ether or acetone and pressed together under an initial pressure. The pressure required may range over a considerable latitude, dependent upon the material strength at the elevated temperature. A range of 2,500 to 4,000 psi. will cover all materials commonly encountered.

Light the torch . . . The heating torch is lighted and circumferentially reciprocated around the interface at a medium speed. The reciprocation is required to prohibit melting or burring the metal at the points where the individual flames impinge on the surface. If an appreciable difference in mass exists between the weld members, additional steps are taken to insure both parts reaching an equal degree of plasticity simultaneously.

As the material at the interface reaches a proper forging temperature, in this case approximately 2,200° F., it will begin to upset as shown in "B" of Fig. 1. The bonding of the metal or the weld has actually occurred at this time.

And weld is made . . . Under the influence of proper pressure and temperature, and without raising the metal above the solidus temperature, the atoms have diffused across the interface and intermingled with those of the opposite member, forming a completely homogeneous mass. An entirely new crystallographic structure has grown across the interface, thereby completely eliminating the same, to the extent that it cannot be detected by microscopic examination or other means.

As a further precaution, the application of heat is continued, and as the upsetting progresses, the mechanism of the machine imparts a longitudinal, reciprocating movement to the torch, in addition to the circumferential motion. The amplitude of the longitudinal motion is gradually increased, causing the upset section to lengthen. The tempo of the reciprocation correspondingly is also increased. It is obvious that the cross-sectional area of the weld is becoming greater throughout the forging cycle, necessitating a constant increase in the gage pressure of the operating system, in order to maintain a constant pressure at the weld. When the form shown in "C" of Fig. 1 is reached, the limit switch automatically shuts off the machine and torch.

Final touches . . . The work is allowed to cool in air after which the torch is relighted and the weld normalized by heating to approximately 1,650° F. and air cooling. The normalizing operation relieves any stresses induced during welding and also refines the grain structure at the weld.

The upset is then machined off the outside diameter and the bore, removing the material containing the original interface as indicated by the dotted lines of "C" of Fig. 1. The weld is carefully inspected by the magnetic-particle method. One of the salient features of pressure welding is the fact that any discrepancy in the weld is readily apparent by surface inspection.

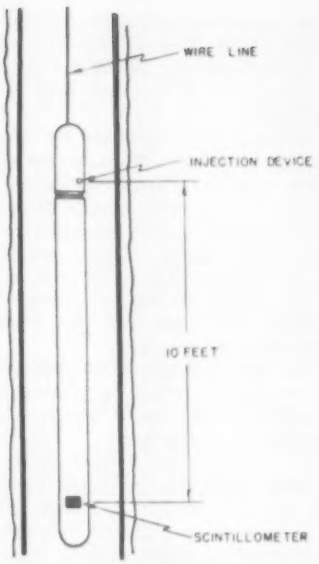


Fig. 1—Schematic diagram illustrating how injection tool is connected to electric conductor cable with logging instrument connected beneath injector.

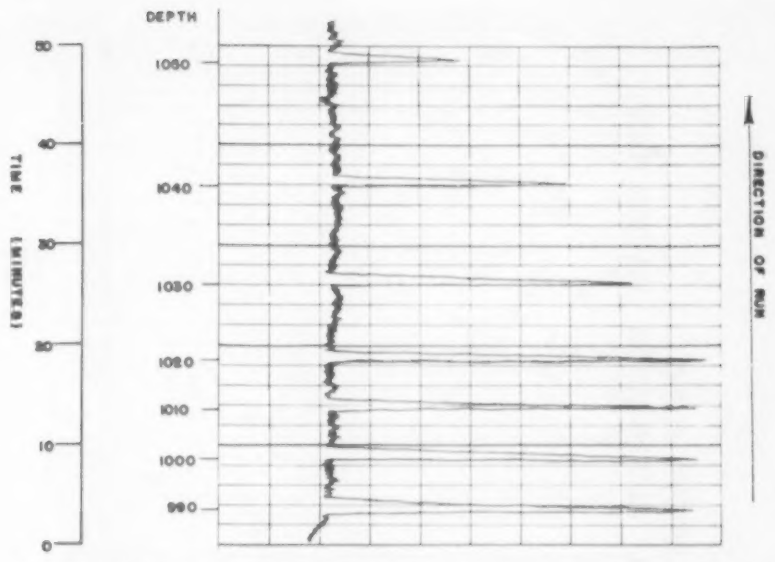


Fig. 2—Sample velocity survey, illustrating the effect of tracing isotope down the bore hole. Note increase in time intervals and decrease in radiation level as isotope is followed. This indicates that progressive loss of fluid is taking place in the interval between 1,020 and 1,050 ft. Chart paper is placed on time drive.

How to use

Radioactive Isotopes for Water-Input Profiles

in water-flood operations

Recently, engineers have made use of the radioactive isotope injection method in combination with the conventional gamma-ray logging instrument to find out just where in the geologic section of an injection well the water is penetrating. This article explains a method for determining where and how much of the injected water is being effective.

by J. M. Edwards and L. E. Holter

ONLY limited literature is available concerning the use of radioactive isotopes in water-flood operations, and this paper is written in order to establish a basic method for conducting such a survey. More research on this subject in the future should provide the engineer with a valuable tool.

Before commencing the actual isotope injection process, a conventional gamma-ray log should be run in the injection well in order to obtain a natural count background for the entire section involved. This is followed by the actual injection process which consists of injecting a small volume of radioactive isotope into the well bore from an injection tool attached to the bottom of the electric conductor cable and connected above the actual logging instrument. This is shown in Fig. 1. If desired, the injection tool may be attached below the logging tool. The injection tool is positively controlled from surface control panel to inject one or more slugs of isotope as required.

Authors are with McCullough Tool Co., Los Angeles.

Inject radioactive slug . . . In the method devised, the slug of isotope is injected at a point 10 ft. above the scintillation counter. By measuring the time elapsed for the slug to travel from the injection tool to the counter, and by following the slug down the bore hole with the counter, the velocity of the injection water throughout the bore hole may be determined. The chart paper is connected to a time drive apparatus and time is accurately recorded on the log.

Besides measuring the velocity of the injection fluid, any loss of fluid may be recorded by the decrease of radioactive intensity as measured from point to point in the well by the radioactivity counts. In addition, when openings such as perforations, leaks, or a shoe occur in the casing, the radioactive slug may be followed by the logging tool in order to determine the direction of travel of the fluid in the annulus between the casing and the well bore.

Sands penetrated by the injection fluid will receive fluid as a function of their permeability, saturation, and pressure differential. Thus, a highly permeable sand of low saturation will receive the fluid at a higher rate than a low-permeability sand of high saturation. By tracing the material through the annulus, it can be determined that sands receiving the fluid will effectively slow the migration speed of the isotope in the annulus. Thus, if a sand is receiving injection fluid, the radioactivity and velocity of the slug will decrease as the isotope is traced to another sand receiving the injection fluid. Fig. 2 illustrates this point.

Velocity of slug . . . The velocity of

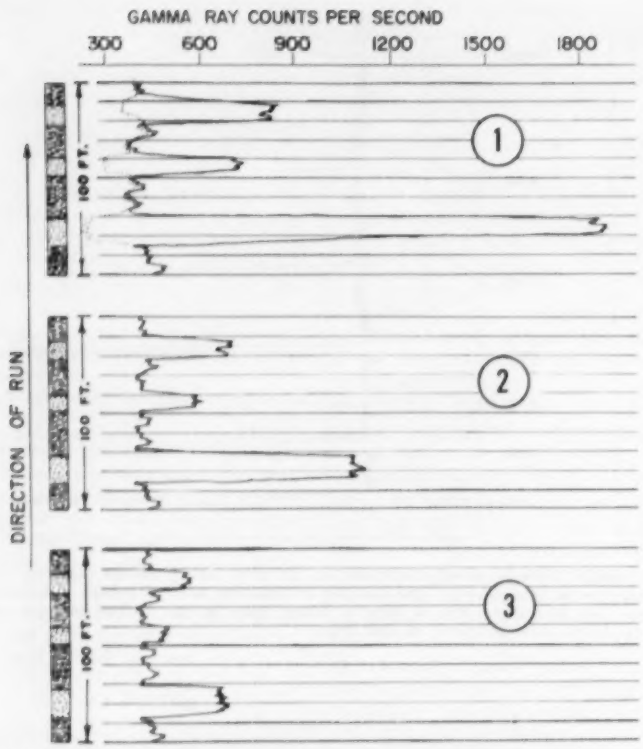


Fig. 3—Sample radioactive survey. The three runs are taken over same 100 ft. of section at 15-minute intervals. Radiation intensity and bed thickness are indicated in diagram. Note background level of radioactivity before injection as indicated by dotted line in run No. 1.

injection fluid through the bore hole should be measured at a point above any opening in the casing by running a velocity profile in a blank section well above perforations, etc. This can be used as a reference for progressive velocity profile work. Depending upon the injection rate, the actual number of slugs of isotope injected may be increased or decreased. If fluid is moving down at a high rate of speed, it may be necessary to inject a number of slugs. However, if the injection rate is slow, one slug may be traced for a considerable distance by continually lowering the counter down the hole.

Since the scintillometer has a comparatively short length and greater sensitivity as compared to other logging counters, it is more satisfactory in this type of operation because it will record the intensity of the slug instantaneously as the slug passes the counter. A typical velocity survey is illustrated in Fig. 2.

Quantitative Measurement

After completing the velocity profile operation, a series of gamma-ray logs should be run over the interval involved in order to record a decay rate for the isotope in the sands receiving the injection material. Sufficient isotope should be injected in one slug before commencing the radioactive profile since a count level sufficiently higher than the count level recorded on the original conventional gamma-ray log is necessary to determine the quantity of isotope invading the sands in question.

Time between runs should be adjusted according to the length of the section in question to be logged and the rate of fluid entry into the sands. A good general rule could be a minimum of 15 minutes. Time must be recorded accurately for the start of each run and logging speed must be constant for each run. In order to be completely accurate, the time at the end of each run should be recorded also. A typical radioactive survey is illustrated in Fig. 3.

How much fluid? . . . By running the radioactive profile series of logs, it can be determined qualitatively which sands are taking the greater part of the fluid. However, it is necessary to determine quantitatively how much fluid each sand is receiving. Thus, it can be determined if remedial work is necessary to shut off unwanted sands.

A method whereby the relative amounts of fluid entering each sand may be calculated is presented as follows, step by step:

1. Run radioactive survey No. 1, accurately recording time of run.

(a) Determine the exact thickness of each bed receiving radioactive isotope.

(b) Determine the count/second level of radioactivity above the base level of radioactivity for each sand receiving isotope.

(c) Multiply the thickness by the number of counts/second radioactivity level for each sand receiving isotope.

(d) Convert the total amount of radioactive isotope injected into volumetric units. For instance, if one curie of radioactivity level has been concentrated in 100 cc. of isotope, consider that 100 cc. of radioactivity has been injected into the formation.

(e) Add the (thickness X count level) factors for each sand to determine a total factor for the entire section receiving radioactive isotope.

(f) Set up a proportion whereby the total factor (thickness X count level) equals the total volume of isotope injected. Consequently, the relative volume of injection fluid entering each bed may be calculated as follows:

$$\frac{\text{Thickness} \times \text{count level (for each bed)}}{\text{Volume of radioactive isotope entering each bed}} = \frac{\text{Total thickness} \times \text{count level (for all beds)}}{\text{Total volume of isotope injected}}$$

2. Run radioactive survey No. 2, accurately recording time of run.

(a) Repeat calculations for run No. 2 and determine the volume of fluid loss for each particular sand. This indicates how much fluid has entered each individual bed.

Volume (each bed in run No. 1) — volume (corresponding bed in run No. 2) = total volume lost into each individual sand.

3. Run radioactive survey No. 3, accurately recording time of run.

(a) Repeat calculations for run No. 3 and determine the volume of fluid loss for each individual bed since run No. 1.

Volume (each bed in run No. 1) — volume (corresponding bed in run No. 3) = total volume lost into each individual bed.

4. Run continuous radioactive surveys over definite periods of time as needed.

(a) Repeat the calculations for each run.

5. Calculate the average volume of loss of fluid into each individual bed over the entire period of time. This will give the percentage intake of isotope for each individual bed.

A number of isotopes may be used in the process. One of the most satisfactory, as found in actual operation, is iodine 131 which has a half-life of 8 days.

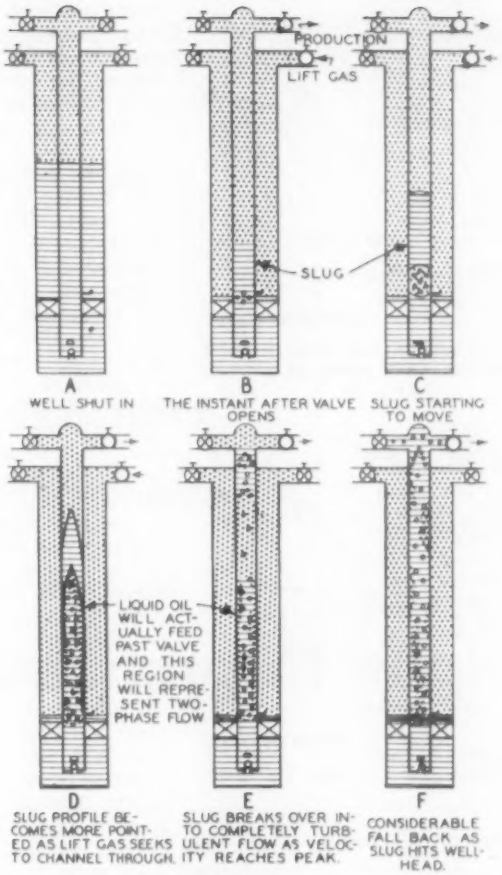

PRODUCTION
LIFT GAS
SLUG
A
WELL SHUT IN
B
THE INSTANT AFTER VALVE OPENS
C
SLUG STARTING TO MOVE
LIQUID OIL WILL ACTUALLY FEED PAST VALVE AND THIS REGION WILL REPRESENT TWO-PHASE FLOW
D
SLUG PROFILE BECOMES MORE POINTED AS LIFT GAS SEEKS TO CHANNEL THROUGH
E
SLUG BREAKS OVER INTO COMPLETELY TURBULENT FLOW AS VELOCITY REACHES PEAK.
F
CONSIDERABLE FALL BACK AS SLUG HITS WELLHEAD.

Fig. 1—The intermittent or ballistic gas-lift flow.

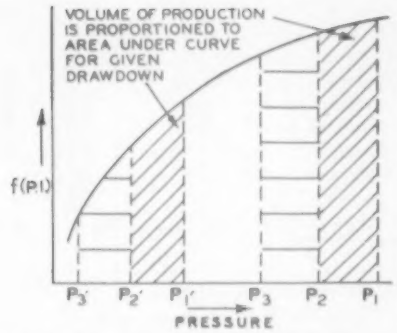
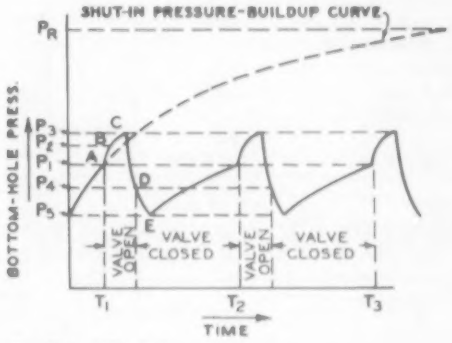


Fig. 2—This comparison of pressure and productivity index illustrates relative ability of reservoir to deliver fluid at high vs. low absolute pressures.



$(T_2-T_1) = (T_3-T_2)$

P_R = stabilized shut-in reservoir pressure

P_1 = b.h.p. the instant the valve opens (A)

P_2 = b.h.p. due to starting inertia (B). This may often be greater than shown.

P_3 = b.h.p. at maximum gradient (C)

P_4 = b.h.p. when valve closes (D)

P_5 = b.h.p. at minimum gradient just as well starts buildup to P_1 for another injection cycle (E)

Fig. 3—Bottom-hole pressure of a well being produced by gas lifting intermittently.

Fundamentals of Gas Lift—6

When Is Intermittent Gas Lifting Better?

by C. V. Kirkpatrick

THE intermittent-flow mechanism is considerably different from the continuous flow mechanism, and it is normally applicable in either wells of high bottom-hole pressure and low productivity index, or low bottom-hole pressure and low productivity index. In either case, an excessively high drawdown resulting in a prohibitive gas-oil ratio is required to produce the desired amount of oil by continuous flow. And in many instances, the reservoir simply is not capable of giving up the desired liquid regardless of the drawdown.

Fig. 1 represents one possible type of intermittent or ballistic flow. The two principal factors that contribute to the vast complexity of the process are seen to be: (1) the flowing gradient, and (2) the contribution of the P.I. of the well's actual deliverability under intermittently operating conditions.

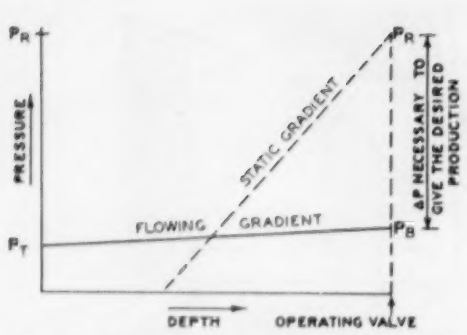
This analysis is principally concerned with the well in which the time required for the shut-in pressure to build up to a maximum is in excess of 12 hours, a characteristic of the vast majority of wells.

Illustrated in Fig. 2 is the effect of absolute pressure on well P.I. for a low-capacity-type reservoir in which the intermittent operation is applicable. The abscissa of this graph may be considered as reservoir pressure and the ordinate as some function of well P.I.

The actual deliverability of the well in terms of stock-tank oil is directly proportional to the area under the curve for any given drawdown. It is, therefore, apparent that for high absolute pressures the P.I. (or well producing ability) is greater than at low absolute pressures.

Drawdown vs. P.I. . . . Although (P_1-P_2) is equal $(P_1'-P_2')$ the area under the curve from (P_1-P_2) is much greater than the area from $(P_1'-P_2')$. This shows that doubling the drawdown will not double the producing capacity of the well. That is, the production derived from the pressure drawdown of $(P_1'-P_3')$ will not be equal to twice the production obtained from the draw-

Author is chairman, department of petroleum engineering, University of Houston.



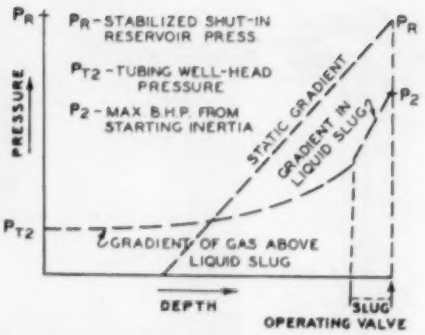
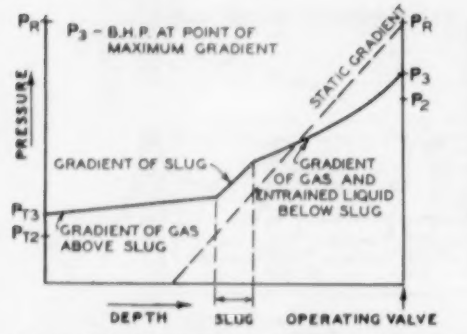


Fig. 4—(Left) The gradient conditions here would be necessary for the intermitting well shown in Fig. 3 if it were to produce by continuous flow. It is obvious that a prohibitive GOR would be required. Fig. 5—(Right) The liquid slug is just starting to move.



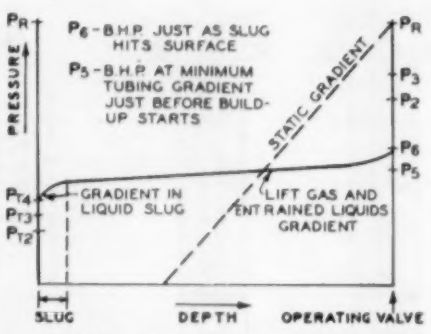


Fig. 6—(Left) The liquid slug is at the position of maximum tubing gradient. Fig. 7—(Right) The liquid is just hitting the well head.

down ($P_1'-P_2'$) even though ($P_1'-P_3'$) is equal to twice ($P_1'-P_2'$).

The P.I. **variation** is much more significant at low absolute pressures than at high pressures. This explains why individual well-performance comparison is not applicable on the basis of straight P.I. considerations. Many operators, having observed a near doubling of production under conditions represented by $(P_1-P_3) = 2(P_1-P_2)$, expect the same results from wells whose deliverability is more nearly representative of $(P_1'-P_3') = 2(P_1'-P_2')$.

The dotted-line curve in Fig. 3 is a sketch of bottom-hole shut-in pressure plotted versus time, a hypothetical pressure-buildup curve. It is to be observed that the buildup curve approaches the actual reservoir pressure asymtotically and hence, most wells never reach true shut-in equilibrium. Familiarization with the typical characteristics of this curve is most important in the analysis of the intermittent flow problem.

The remainder of the curves are a graphical picture of a well being produced intermittently by gas lift, with the bottom-hole pressure versus time and injection cycle superimposed on the buildup curve. Fig. 4 illustrates the gradient necessary in the same well, to produce the desired amount of oil by continuous flow. It is clear from this comparison that a prohibitive gas-oil ratio would be required for continuous flow.

Slug buildup . . . Now back to Fig. 3, from which it is evident that the maximum reservoir buildup before each injection cycle, P_1, is considerably less than P_R (stabilized shut-in bottom-hole pressure), so the well liquid is feeding past the injection valve as the slug is being moved up the tubing. Therefore, cycle frequency must be determined by the well's buildup ability between pressures P_5 (the point of maximum drawdown) and P_1.

If the buildup curve is comparatively steep initially, then the frequency of the injection cycle may be relatively short. If the buildup curve is comparatively flat, then the frequency of the injection cycle must be relatively long. The optimum cycle frequency can be obtained only through multiple trials, because for any given well exact contribution of the P.I. is unknown. In the case of continuous flow, it is pressure drawdown that causes the reservoir fluid to feed continuously into the well stream and be simultaneously produced. The ballistic process, however, depends on the reservoir feed-in due to pressure point to a somewhat higher one.

What is flow gradient? The flowing gradient in an intermittently produced gas-lift well is a summation of three basic components: (1) the gradient of the gas above the liquid slug, (2) the gradient of the liquid slug, and (3) the gradient of the lift gas and its entrained liquids below the slug. Therefore, this gradient cannot be represented by a single line as can be done in continuous flow, because it is changing too radically at different points in the tubing. It can be qualitatively illustrated, however, by representing all three gradients relative to different positions of the liquid slug in the tubing. This has been done in Figs. 5, 6, and 7. Fig. 8 shows all of the foregoing figures plotted on one graph.

It is well to point out the effect of conventional right-angle tubing heads on the liquid slug. Experience has shown that 40 to 60 per cent of the total liquid slug is lost to slippage, liquid hang up, or fall back. Also the lift gas will have channeled completely, or nearly, through the liquid slug by the time it hits the surface. Therefore, it is probable that most of the liquid loss is at the well head.

The conclusion to be drawn from this discussion is that the ballistic flowing gradient is so complex that any attempt to establish it by theoretical computation is not justified.

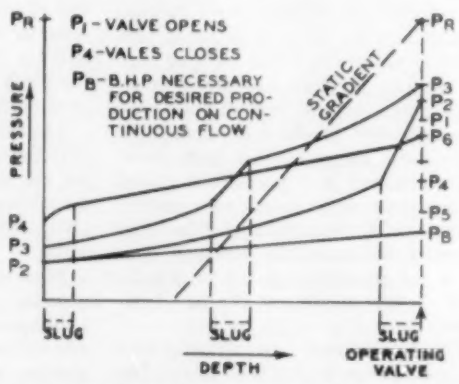


Fig. 8—The plots of Figs. 1, 2, and 3 are here superimposed.

Gulf experience affords valuable case study on

Pipelining of Highly Viscous Crudes

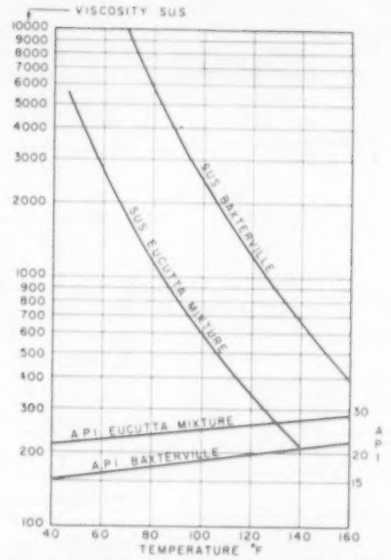


Fig. 1—Characteristics of the two Mississippi crudes handled by Gulf's line.

Crude oils from several fields in Mississipi are very heavy and require heat for efficient movement by pipeline. The heaviest of these is Baxterville crude which has a viscosity of 17,400 S.U.s. and a gravity of 16.4° A.P.I. at 60° F.

The pipeline installed by Gulf to move this oil extends from Lumberton, Miss., to Mobile, Ala., a distance of 88 miles. It is a 14-in. line with a designed capacity, based on known and anticipated developments in the originating area, of 42,000 bbl. per day. Top operating pressure is 1,000 psi. and positive-displacement pumps are used.

The oil is heated at the originating station, at an intermediate booster, and at eight heater stations spaced at about 9-mile intervals.

by Morgan Martin

IN planning a pipeline to handle viscous oils, it is first necessary to make laboratory tests on the oil at various temperatures to determine gravity and viscosity values for use in the heat-loss formulas. Also needed before proper design work can commence, is information such as average atmospheric temperature of the region through which the pipeline is routed, types and condition of soils, and elevations along the route.

With these data a realistic study can be made to determine thermal and hydraulic characteristics which the completed line will exhibit.

Heat-loss calculations . . . The best known data on handling heated oil in pipelines is that found in a series of articles written by Fritz Karge, formerly chief engineer of a California oil company.* Development of his formula, and a modification used here, is as follows:

Nomenclature:

t_1 = difference between initial temperature of oil and atmospheric temperature

t_2 = difference in final temperature of oil and atmospheric temperature for the section under consideration

t_m = mean difference in temperature between oil and atmosphere

C = average specific heat of oil

s = specific heat of oil

Q = flow rate, barrels per hour

K = heat-transfer coefficient, oil to ground, (B.t.u. per hour per sq. ft. per °F.). Karge's values for this factor are given in Table I

D = outside diameter of pipe, in.

X = length of line, miles

W = weight of barrel of water (taken as 350 lb.)

H_L = heat loss from oil, B.t.u.

Theory of heat transfer tells us that:

$$H_L = W\,s\,C\,Q\,(t_1 - t_2) \qquad (1)$$

This loss also equals the outside surface area of pipe for the length under consideration times the mean temperature difference times the heat-transfer ciefficient, or:

$$H_L = (\pi D/12)\ 5{,}280 \times t_m\ K \qquad (2)$$

Combining the two equations:

$$W\,s\,C\,Q\,(t_1 - t_2) = (\pi D/12) \times 5{,}280 \times t_m\ K$$

or

$$(t_1 - t_2)/t_m = [(\pi D/12)\ 5{,}280 \times K]/(W\,s\,C\,Q) \qquad (3)$$

For intervals of 1 mile this can be expressed as:

Degree loss per mile per °F. difference in temperature = (outside area of line per mile × K)/(weight of barrel of oil × specific heat × barrels per hour)

which is the form used in making calculations for this line.

Soil conditions . . . The condition and type of soil covering the pipe is a very large factor in the heat loss, and the importance of obtaining sufficient knowledge of soil through which the

TABLE 1—K FACTORS FROM F. KARGE

(K in B.t.u. per square foot per hour per degree difference in temperature of oil and air)

Soil and condition—	Cover (in.)	K
Sandy—dry	24	0.25 to 0.40
Sandy—moist	24	0.50 to 0.60
Sandy—soaked	24	1.10 to 1.30
Clay—dry	24	0.20 to 0.30
Clay—moist	24	0.40 to 0.50
Clay—moist to wet	24	0.60 to 0.90
Sandy—dry	8	0.60 to 0.70
Sandy—moist to wet	8	1.20 to 2.40
River—60 in. water	60	2.00 to 2.50
Air—exposed		2.0 (approx.)

Factors are for bare steel pipe, reduce by 15 per cent for ⅜ to ½-in. thick asphalt and felt wrapping.

*See Petroleum Engineer, March, April, and May 1945.

Author is assistant to general manager, Gulf Refining Co., pipeline department. Paper presented at the petroleum mechanical engineering conference of the American Society of Mechanical Engineers, Los Angeles, September 26-29, 1954.

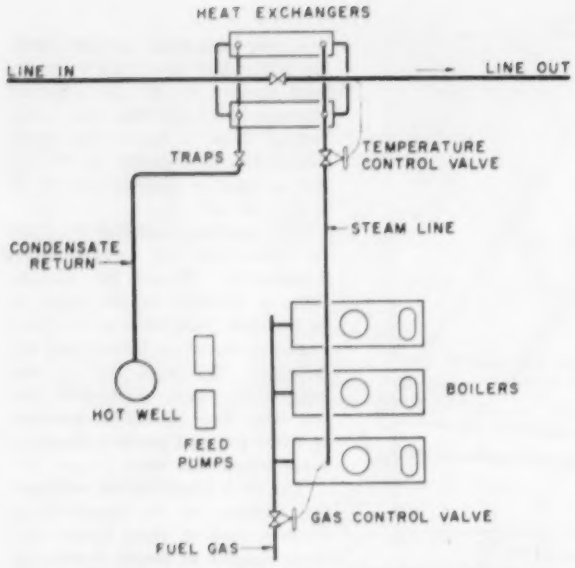


Fig. 2—Schematic of typical heater station. A total of 10 such stations were installed on the 88-mile line. The boilers normally burn gas but can be switched to crude in case of gas failure.

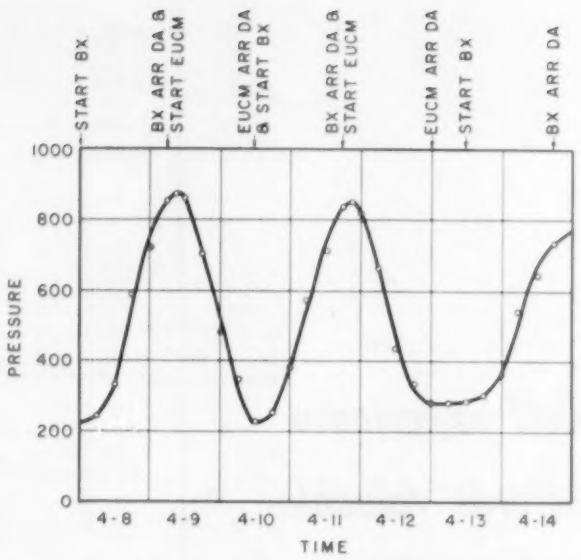


Fig. 3—Typical variation in Lumberton discharge pressure through 7-day cycle.
Chart nomenclature: BX. = Baxterville crude, EUCM. = Eucutta mixture, DA. = Lucedale pump station.

pipeline will be laid cannot be overemphasized. On the line described here, a soil survey was conducted along with the line survey. Information weighted out from this detailed survey indicated that a K factor of 1.0 would cover the worst winter conditions to be expected along the route.

Study of U. S. Weather Bureau information indicated that a 50° F. atmospheric temperature would be an average low for wintertime for calculation purposes. Short, sharp, low atmospheric temperatures have very little effect on ground temperatures at pipeline depths of 24 in. or more of cover and the average temperature of the ground is very close to the average daily atmospheric temperatures. Winter conditions were used for design purposes since oil must be moved throughout the year.

Since heat loss is dependent on the temperature between the oil and the ground it is desirable that this difference be held to a minimum. An investigation of the Baxterville oil at 130° F. initial temperature against the 50° F. ground temperature with a K factor of 1.0 was started. A calculation sheet was devised in order that all factors could be set out clearly for analysis and further use. Table 1 shows such a typical calculation sheet.

Calculations are based on 1-mile sections on pipeline, and since temperature difference is not very large, the average temperature is taken as an arithmetical average. This short cut saves the engineer numerous calculations over the logarithmic method of finding averages, and the per cent of error is no greater than the assumptions on the weather to be expected and on the soil conditions to be found along the completed line.

Using the viscosity curve of the oil to be pumped (see Fig. 1) the S.U.s. viscosity and °A.P.I. gravity are determined for the average temperature for each 1-mile section. The three factors now known, barrels per hour, S.U.s. viscosity, and °A.P.I. are entered on a curve for 14-in. pipe to determine the pressure drop in pounds per mile.

Calculation sheet . . . Calculations should be made in an orderly fashion for ready reference to the various factors shown. A sample sheet is shown in Table 2.

Two columns for pressure drop are used since heavier-wall pipe for the discharge side of the stations was used. The last column on the data sheet shows the accumulated pressure drop.

From the Table 2 example for a 10-mile section, it is apparent that reheat will be needed between 8 and 9 miles in order that 1,000-psi. discharge pressure will reach for five sections with approximately 200-psi. pressure drop in each section.

For the Mississippi pipeline of 88 miles total length, this meant a booster station halfway down the line and four intermediate heater stations in each pumping section.

An addition of the static head and the pressure drop through the five sets of heaters gives the total discharge pressure required at each of the two stations.

Mechanical Equipment

Prime movers at Lumberton, the originating station, and Lucedale, the inter-

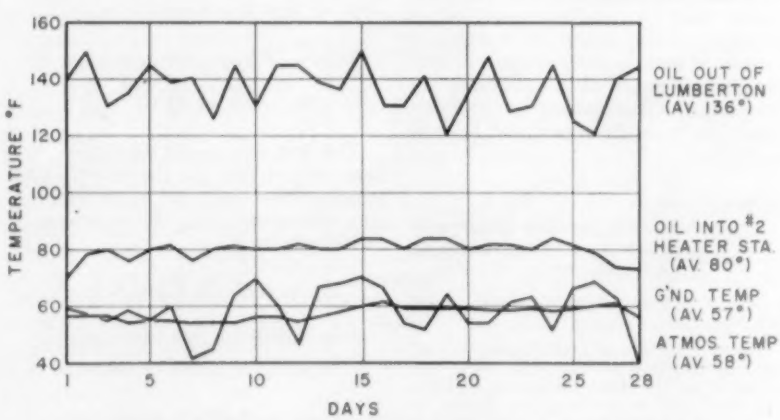


Fig. 4—Variations in air, ground, and oil temperatures through February 1954.

mediate station, are three gas-diesel five-cylinder engines rated at 400 b.hp. and 400 r.p.m. Attachments of the very latest design enable the engines to convert automatically from dual fuel to full diesel and back to dual-fuel again. Sensitive pneumatically operated hydraulic governors incorporated in the engines give very close speed control and work in conjunction with a pressure controller where desired.

Engine lubricating-oil cooling and jacket-water cooling is performed by individual fan and radiator units. Lube oil is cleaned continuously through a heated pressure-filter unit on each engine.

Reciprocating pumps are connected to the engines through speed reducers. A comparatively slow-moving pump having very large valve ports handles the heavy crude oil very satisfactorily.

The wide-speed-range characteristics of the engines give each pump unit a capacity of between 13,500 and 16,500 bbl. per day. This high-flexibility allows one unit to be shut down for repairs or adjustment while the other two carry the load.

Tanks at Lumberton are equipped for steam-heating the oil. Suction lines between the tanks and pump stations have steam lines inside so sluggish oil can be heated to fill the pumps effectively.

Boilers . . . For the oil-heating unit at the pumping stations and the heater stations, three oil-country-type boilers are used. These are rated at 150 b.hp. and 300 psi. working pressure. Heat is transferred to the oil by two shell-and-tube heat exchangers at each location.

Since natural gas is available at all locations, combination gas-oil burners were installed in the fireboxes. In event of an interruption of gas, the burners can be switched over to crude oil, since it is absolutely necessary that heat be available when needed.

Extended fireboxes and extra long stacks were added so that two boilers will be able to furnish all the heat in case one boiler is out of service for any reason.

To conserve heat, the boilers, heat exchangers, and all station piping are insulated; also, the feed water is heated by returning condensate.

To make the heater stations as automatic as possible, auxiliary equipment includes temperature controller and control valve at the heat exchangers, pressure-operated gas-firing controller, feed-pump governor, feed-water regulators, low-water alarms, and fuel-shutoff valves. A 100-bbl. fuel tank, with steam-heating coil inside, erected on a tower nearby makes oil fuel readily available in the event of a gas-line failure.

Diagram of a typical heater station is shown in Fig. 2.

Operation

Lumberton station pumps both Baxterville oil, the heavy oil the line was designed for, and Eucutta mixture, still a heavy oil when compared to the average crude oils, but light when compared to Baxterville. Production rates are approximately equal between the

TABLE 2—HEAT LOSS AND PRESSURE DROP CALCULATIONS

14-in. line at 42,000 bbl. per day or 1,750 bbl. per hour
Degree loss per mile per 1° difference in temperature = 0.0671

K = 1.0
Ground temperature, 50° F.
Specific gravity, 0.94

Mile	Temp. in	Diff. temp.	Deg. loss	Temp. out	Average temp.	Viscosity S.U.s.	Gravity A.P.I.	Gravity Sp. grav.	Pressure drop per 1 mi. ⅜-in. wall pipe	Total pressure drop, psi.	Pressure drop per 1 mi. ½-in. wall pipe	Total pressure drop, psi.
1	130	80	5.4	124.6	127.3	970	20.1	.9340	12.1	12.1	11.6	11.6
2	124.6	74.6	5.0	119.6	122.1	1,160	19.8	.9352	13.1	25.2	12.6	24.2
3	119.6	69.6	4.7	114.9	117.2	1,360	19.5	.9371	17.0	42.2	16.3	40.5
4	114.9	64.9	4.4	110.5	112.7	1,590	19.3	.9383	19.7	61.9	19.0	59.5
5	110.5	60.5	4.1	106.4	108.4	1,850	19.1	.9396	23.1	85.0	22.3	81.8
6	106.4	56.4	3.8	102.6	104.5	2,130	18.9	.9408	26.5	111.5	25.6	107.4
7	102.6	52.6	3.5	99.1	100.8	2,470	18.7	.9421	30.8	142.3	29.7	137.1
8	99.1	49.1	3.3	95.8	97.4	2,780	18.5	.9433	34.4	176.7	33.2	170.3
9	95.8	45.8	3.1	92.7	94.2	3,150	18.3	.9446	39.1	215.8	37.7	208.0
10	92.7	42.7	2.9	89.8	91.2	3,550	18.1	.9459	43.9	259.7	42.3	250.3

$$\text{Degrees loss per mile per 1° difference in temperature} = \frac{19{,}352 \times 1.0}{350.72 \times 0.50 \times 0.94 \times 1{,}750} = 0.0671$$

TABLE 3—HEAT LOSS AND PRESSURE DROP CALCULATIONS, LUMBERTON TO HEATER STATION NO. 3, APRIL 9, 1954

32,000 bbl. per day or 1,333 bbl. per hour
Degree loss per mile per 1° difference in temperature = 0.0528 (3 miles = 0.1584)

K = 0.60
Ground temperature, 70° F.
Specific gravity, 0.94

Mile	Temp. in	Diff. temp.	Deg. loss	Temp. out	Average temp.	Viscosity S.U.s.	Gravity A.P.I.	Gravity Sp. grav.	Pressure drop per 3 mi. ⅜-in. wall pipe	Pressure drop per 3 mi. ½-in. wall pipe	Total pressure drop, psi.
3	140	70	11	129	134.5	780	20.2	.9328	21.0		21.9
6	129	59	9	120	124.5	1,170	19.8	.9352	33.0		54.9
9	120	50	8	112	116	1,400	19.3	.9383	39.6		94.5
12	112	42	7	105	108.5	1,800	19.0	.9402	50.4		114.9
15	105	35	6	99	102	2,300	18.5	.9433	66.0		210.9
18	99	29	5	94	96.5	2,900	18.2	.9452		78.9	289.8
21	94	24	4	90	92	3,400	18.0	.9465		96.0	385.8
24	90	20	3	87	88.5	4,000	17.8	.9478		114.0	499.8
27	87	17	3	84	85.5	4,500	17.6	.9490		129.0	628.8

OBSERVED CONDITIONS:

Lumberton temperature, °F.	140	Lumberton pressure, psi.	880
No. 3 heater station temperature, °F.	84	No. 3 heater station pressure, psi.	280
			600
		Static head, psi.	28
		Total pressure drop, psi.	628

two oils, and pumpings are scheduled in blocks of approximately 40,000-50,000 bbl. each.

This type operation makes for very erratic discharge pressures at the pumping stations. A 7-day example in April is shown in Fig. 3. As Baxterville oil filled the line to Lucedale station the discharge pressure at Lumberton climbed to a high of 860 psi. With starting of Eucutta mixture the pressure fell to a low of 220 psi. by the time the section to Lucedale was completely filled with the lighter oil. The next block of Baxterville oil caused the pressure to climb back up again, and the cycle continued day after day.

Fig. 4 shows the temperature record for February 1954. These are daily averages between the high at 1:00 p.m. and low at 5:00 a.m. Note the little effect daily highs and lows of atmospheric temperatures had at this depth in the ground.

During the winter months it is the custom at Lumberton to add heat in the line with the starting of Baxterville crude, and to lessen the heat on starting the Eucutta mixture. From the top line plotted on Fig. 4 this is quite apparent. Average input temperature was 136° F. for the month.

Temperature of the incoming oil at the No. 2 heater station, 17½ miles from Lumberton, averaged 80° F., and was affected very little by the range of temperatures at Lumberton.

Check on formula . . . During a period of stable weather in February 1954, checks were made to determine the accuracy of the design formula. Pressures and temperatures were recorded when a batch of Baxterville crude was being pumped at an even rate of 32,000 bbl. per day.

Next, a study of the weighted average on soil conditions mentioned earlier indicated that the line from Lumberton to No. 2 heater station was laid in sandy-clay soil and the condition was moist to wet. From heater station No. 2 to No. 4 the soil was predominantly clay and more moist than wet. The section from heater station No. 4 to Lucedale station crosses the Pascagoula River and several miles of river bottoms which are sandy soil and wet.

The following values of K were used in the formula and agree well with Karge's K factors: 0.75 for the sandy clay, moist to wet; 0.65 for the clay, more moist than wet; 1.70 for the river and wet bottom lands.

These K values were used to calculate the terminal temperatures at the end of the three sections; calculated and observed values agreed. Pressures corrected for static head and heat-exchanger friction, were to be within 5 psi. of gage readings.

Another investigation was made in April on the 27-mile section between Lumberton and heater station No. 3. By this time of year the sandy-clay soil was not as wet as in February so a K of 0.60 was used. Calculated and observed values were the same as shown in Table 3.

Since the 14-in. line has been completed the weather has not been severe enough during the winter, nor have pipeline runs reached the 42,000-bbl. figure, so that operating conditions could be field-checked against the design for maximum flow.

Shutdown gives no trouble . . . One other interesting phase of operation of a heated-oil pipeline occurred when it was necessary to shut the line down. During a rainstorm and impending hurricane last September, it was deemed advisable to suspend operations and clear the area of personnel. The line was shut down at 6:00 p.m.; the storm blew over and operations were resumed at 8:00 a.m. the next day.

One section of the line was full of the lighter crude and the other had Baxterville crude. One pump at each station was started and operated at the slowest recommended speed for 3 hours before adding the second unit.

The maximum discharge pressure reached in the 3 hours was 530 psi., with one unit operating at 80 per cent capacity. Four hours after adding the second unit, operations were quite normal and pressures and temperatures were as usual.

Longest Plastic Pipeline

...three men composed pipe-laying crew

THE longest continuous plastic pipeline in the country was recently installed near Heidelberg, Miss., to carry unwanted salt water from 25 producing wells to a central disposal well.

The line was laid for East Heidelberg Salt Water Disposal Co., a company formed to solve the common problem of 14 independent operators in getting rid of produced salt water.

Laid at a rate of 1 mile per day, the 12-mile plastic line ranges in size from 2 to 6-in. and is essentially a low-pressure installation. In fact, it is a gravity-flow line for over 90 per cent of its length, pumps being necessary at only two locations. At these locations small pumps give the salt water the necessary boost over some sharp ridges.

Low-cost construction typified the installation; the equipment consisted of a dozer, ditcher, and pickup truck and the pipe-laying crew had a staggering total of three men. In laying, one man strung the pipe, carrying as much as 10 joints at a time (the 2-in. weighs ¼ lb. per foot), while the other two made the joints, using a quick-drying solvent. Each joint connection required about 1 minute.

Pipe for the line was manufactured from Kralastic, a plastic and rubber material produced by the Naugatuck Chemical Division of United States Rubber Co. It was extruded into 30-ft. sections by Southwestern Plastic Pipe Co., Mineral Wells, Tex.

Two-man lowering-in crew for the 12-mile plastic pipeline, which was installed for salt-water disposal in Mississippi.

Tennessee Production Co.'s R. R. Dean plant near Banquete, Tex., is designed to handle 100 M.M.c.f.d. of lean gas.

Tennessee Production Co.'s new plant designed for

Simplicity, Flexibility, Economical Operation

by R. R. Dean

TENNESSEE PRODUCTION CO. has placed in operation its R. R. Dean natural-gasoline plant near Banquete, Tex., designed to extract 70,000 gal. per day of products from 100 M.M.c.f. of lean gas.

The gas-gathering system, some 150 miles long, receives high-pressure well gas from several counties in Southwest Texas. The gas, after being stripped of the recoverable hydrocarbons, enters the Tennessee Gas Transmission Co. pipeline system.

Design features of the plant include:

1. A lean-oil dehydration unit which permits the use of steam for stripping without further dehydration of the absorber residue gas.

2. Use of a demethanizing absorber to handle rich oil, which simplifies plant operation and minimizes recompression and recycle cost.

3. A plant design wherein particular attention has been given to operating flexibility and simplicity.

4. Extensive instrumentation, provided to permit maximum operating efficiency and safety with minimum operating personnel.

Basis for Plant Process Design

It was established that the plant would be designed and built to handle 100 M.M.c.f.d. of gas of the following composition:

GAS ANALYSIS

Composition:	Mole per cent
CO_2	0.05
N_2	0.24
C_1	91.77
C_2	4.62
C_3	1.89
i-C_4	0.46
n-C_4	0.44
i-C_5	0.15
n-C_5	0.09
C_6	0.20
C_7+	0.09
Total	100.00

Other design factors were:

1. Type of process	Oil absorption with refrigeration to 50° F.
2. Absorption pressure, psig.	750
3. Inlet-gas temperature, °F.	70
4. Propane recovery, per cent	40 to 50
5. Maximum allowable water content of residue gas, lb. per M.M.c.f.	7

Plant Process Flow

The gas entering the plant from the pipeline divides into two streams and flows through twin absorber towers for stripping of the recoverable liquid hydrocarbons. It is afterwards recombined into a single stream for returning to the pipeline. (See Fig. 1 for the process flow.) Recording meters are provided on the split gas streams so that the proper balance of gas flow through the absorbers can be maintained at all times.

Two absorbers . . . The use of two absorbers is one of the many flexibilities of this plant. In the event it becomes necessary to shut down one absorber, the plant can still be operated at 50 to 60 per cent capacity. Also, if during certain periods the pipeline curtails its flow of gas sufficiently, one absorber

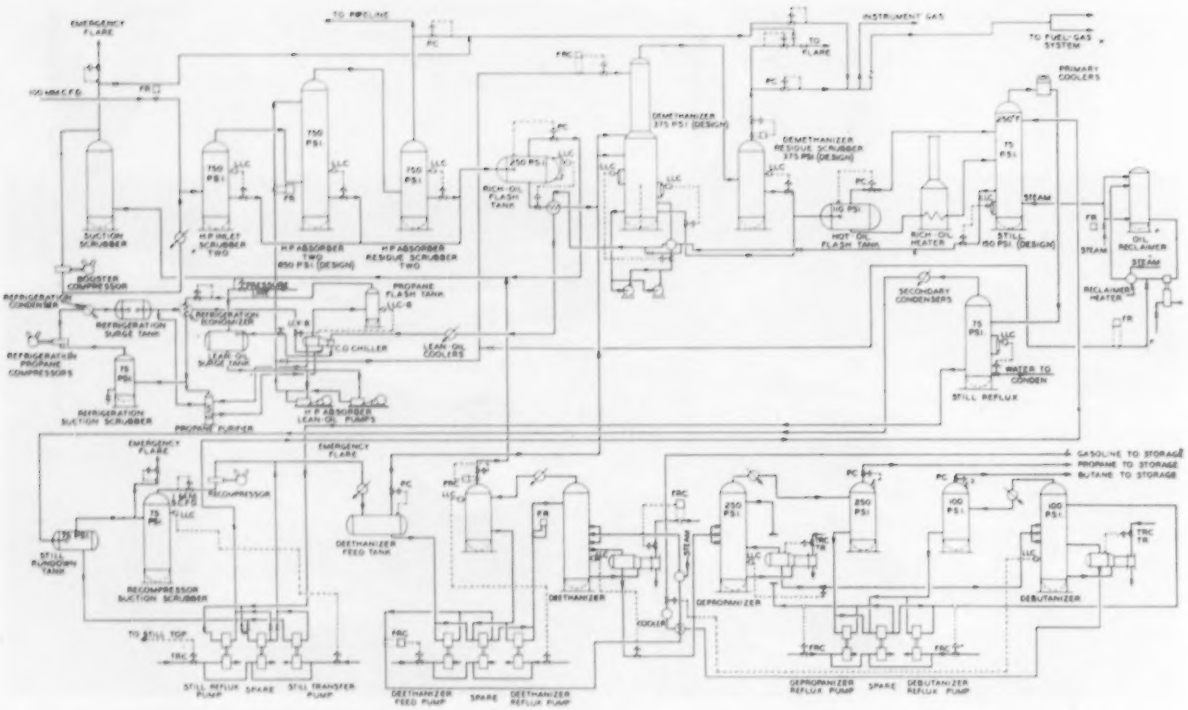


Fig. 1—Gas entering plant from pipeline divides into two streams and flows through twin absorber towers for stripping of the recoverable hydrocarbons.

could be taken out of service. All excess flash gases above fuel requirements are boosted to absorption pressure for return to the pipeline system, requiring approximately 250 b.hp.

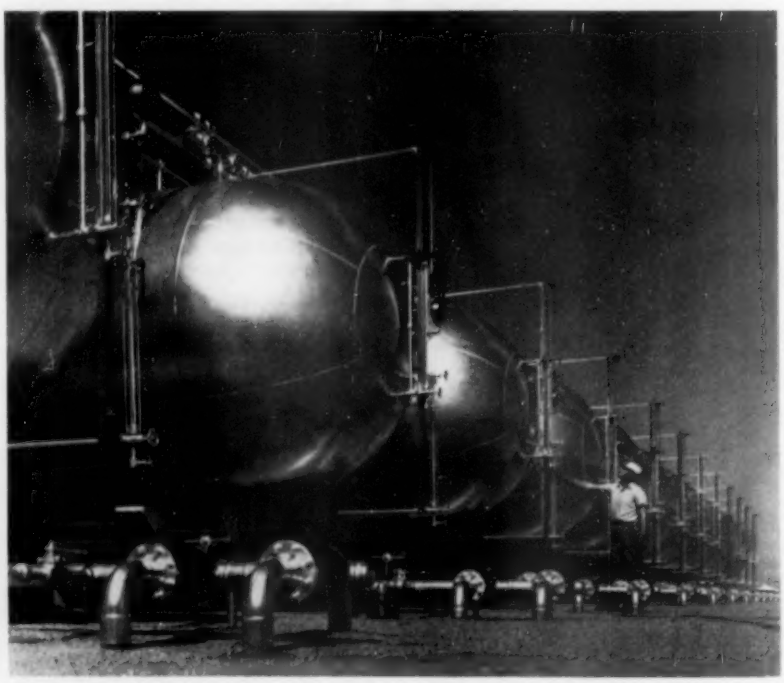
Absorption oil flow . . . The absorption oil rate over the main absorbers is approximately 650 g.p.m. As in the case of the inlet-gas stream, the oil stream is likewise split and each stream is provided with recording meters. The rich oil from the absorbers, controlled by liquid level, flows to a rich-oil flash tank operating at a controlled pressure of 300 lb. From the flash tank by liquid-level regulation, the rich oil then flows to the demethanizer. This feature is a departure from the more conventional oil-absorption plant, but has become more popular during recent years particularly in the design of high-pressure extraction plants.

Demethanizer advantages . . . Among the advantages of using the rich-oil demethanizer are:

1. High propane retention.
2. Simplicity of operation and control.
3. Less oil circulation.
4. Lower fuel requirements.
5. Reduction in plant recycle vapors.
6. Future possibility of ethane recovery.

Control of the rich-oil demethanization operation is provided by variations in: (a) operating pressure; (b) operating temperature; and (c) absorption oil circulation over the top of the tower. Reboiler heating is provided for the demethanizer by exchanging heat with the hot lean-oil stream.

The demethanized rich oil then flows, through liquid-level control, to a hot-oil flash tank. Flashed vapors are removed at this point and pass directly to the rectifying section of the stripping still. The rich oil then flows to



These pressure vessels are used to store some of the 70,000 gal. of product extracted each day.

the direct-fired heater where its temperature is raised by automatic control to the desired level. The rich-oil heater has protective devices designed to shut off the fuel gas in the event of either a flow stoppage or a ruptured tube.

Stripping . . . From the heater, the rich oil flows directly to the stripping still where it is steam stripped of recoverable products. The still operation is controlled as in conventional plants by variation of: (1) top temperature; (b) pressure; (3) stripping-steam volume; and (d) feed temperature. The denuded oil, before completing its cycle, has its dissolved water removed. This has distinct advantages in that there is no free-water dropout anywhere in the system and it is not necessary to dehydrate the residue gas.

The denuded oil then flows through the exchangers, coolers, and chiller to the surge tank. The lean-oil chilling to 50° F. is accomplished by propane refrigeration, and requires approximately 700 b.hp. to handle the propane vapor.

Still condenser system . . . The still overhead cooling is accomplished in primary and secondary units. The primary unit operating at a high-temperature level to save utilities and surface, handles all of the still reflux as well as most of the stripping-steam condensing duties. The secondary unit completes the cooling and condensing before the products flow to the still-rundown accumulator. The products stripped from the oil in the distillation unit are combined, by recompression and pumping, into a single stream to feed the plant fractionating system. Recompression horsepower requirements are approximately 100 b.hp.

Fractionation . . . The plant fractionating system consisting of a deethanizer, a depropanizer, and a debutanizer handles the product flow in the order named. Control of the deethanizer is such that only a single control adjustment is required other than rate of feed. This is accomplished essentially by supplying the reboiler heat by controlling the volume of steam at constant pressure, the column pressure being maintained at a constant set point. The column reflux rate is controlled by liquid level so that all reflux condensed is pumped back to the tower. The constant column pressure is controlled by a regulator which vents off the excess accumulator vapors. Both the depropanizer and the debutanizer operate in the conventional manner which is: (a) constant pressure; (b) reboiler temperature controls; and (c) rate of flow of reflux controls.

Plant Operating Data

A typical 24-hour operation for the plant would give the following data:

1. Inlet gas, M.c.f.	119,607
2. Total plant production, gal.	72,299
3. Fuel used, M.c.f.	1,548
4. Absorber pressure, psig.	750
5. Inlet-gas temperature, °F.	68
6. Total absorption oil circulation, g.p.m.	743

Plant Mechanical and Utility Features

Incorporated in the plant mechanical design are several features interesting to the gasoline-plant engineer and operator.

Absorption of oil pumping . . . This requirement is handled by two parallel operating units. Each of these units consists of a quintuplex horizontal plunger pump driven through a reduction gear by an internal-combustion engine. The capacity of each pump and its drive is such that approximately three-fourths of the oil-circulating capacity can be handled on an intermittent basis with one pump not operating. This is of immense value to the operator; in case of an emergency shutdown for repair, plant operations are not seriously curtailed.

The electric generating plant consists of three 250-kw. three-phase, 60-cycle, 480-volt, 400-r.p.m., 0.8-power factor, open-type generators directly connected to 306-b.hp., 400-r.p.m., vertical V-type gas engines. One unit is a complete standby, with two units operating in parallel under partial load.

Cooling . . . The plant cooling load is divided between air-cooled equipment and water-cooled equipment. Engine-jacket water cooling and the stripping-still overhead-reflux condensing duties are both handled in air-cooled equipment. Each of these cooling units is equipped with two electric-motor-driven fans which are provided with automatically controlled, variable-blade-pitch devices. The balance of the plant cooling load is dissipated in an induced-draft, water-cooling tower.

The plant steam is generated by three 150-hp., 350-psi., all-welded, locomotive-type boilers. Normally all three boilers operate in parallel. However, the steam capacity is such that two boilers can handle the plant demand at about 150 per cent of nominal rating.

Gas-boosting, vapor-recompression, and propane-refrigerant-compression duties are handled in three parallel operating units. All of these units are identical in service and cylinder sizes. This offers operating flexibility in that one unit can be shut down for repairs and the plant compression load can still be operated at two-thirds of capacity.

Steam reciprocating pumps are used for product transfer, reflux, and boiler feed-water services with suitable spares provided. It was decided to use steam pumps because volumes are comparatively small and there is a demand for exhaust steam in the plant for stripping and heating. The plant steam balance is such that a slight makeup of live to exhaust steam is required.

The plant water supply is furnished by two 100-g.p.m. water wells. These wells are completed at 860-ft. depth and are "gravel-wall" wells with electric-motor-driven pumps. Since plant water requirements are only 75 g.p.m., the plant is assured of ample water supply since one well can more than furnish the demand. Because the water in this area is high in mineral content, it was necessary to install water-softening and treating equipment.

Flexible operation . . . In the design and layout of the plant, every effort was made to provide for simplicity, flexibility, and economical operation in conjunction with economical construction. All codes, insurance requirements, and approved engineering practices were complied with to insure a safe operation. All gas-compression facilities are protected with automatic and manual shutdown devices. The plant inlet and outlet gas streams can be shut in with remote-controlled, cylinder-operated plug valves.

O. L. Olsen Co., Houston, engineered and constructed the plant.

The time required for the completion of this plant, ready to operate, was 10½ months from the date of contract award, which includes the time required for engineering, purchasing, and construction.

THE AUTHOR

R. R. Dean, vice president of Tennessee Production Co., studied mechanical engineering at Carnegie Tech and served in World War I as an aviator. He was chief engineer from 1921 to 1925 with Waite Phillips Co., and from 1925 to 1930 was in charge of natural-gasoline plants for Independent Oil & Gas Co. He went into business for himself in 1930 and built and operated several natural-gasoline plants, including the Del Rey Petroleum Co. plant near Chesterville, Tex., of which he was a principal owner.

In 1952, assets of Del Rey were sold to Tennessee Production Co., at which time Dean joined the company to handle plants and marketing. He was elected vice president December 1, 1952. The company has named its newest natural-gasoline plant at Banquete, Tex., for Dean.

What's New in Drilling Instruments?

It is logical to forecast a continued increase in the average depth of wells drilled. Such a trend requires a progressive advance in the contractor's skill, equipment, and technique; which will result in an even greater dependence on instruments and control equipment. Drilling control instruments, recording devices, and automatic feed equipment are available to meet requirements of the deepest drilling jobs in prospect. A wider acceptance of, and dependence on, these instruments will bring further developments to best meet the changing requirements of the industry.

by E. L. Decker and F. S. Crane

AS a general classification, drilling control instruments may be considered those which give a continuous indication of the variables under control of the driller, and which affect bit action. The use and interpretation of the information obtained from instruments can give the driller maximum control over the rate of drilling, bit life, hole deflection and drill string life.

Drilling control instruments include:

1. Weight-control equipment.
2. Hydraulic-system instruments.
3. Torque gages.
4. Rotary-speed indicators.
5. Other auxiliary instruments.

Weight indicators . . . All standard commercial drilling-weight indicators take their signal at the surface, most of them from the dead end of the tackle system. Admittedly, the logical point at which to measure hook loads is at the book itself. Bit loads would be most accurate if measured at the bottom of the drill string. However, in either case, the problem of practical transmission of signals to the driller's position has not been solved.

Author Decker is president, and Author Crane is chief engineer, Martin Decker Corp. Paper presented at A.A.O.D.C. annual meeting, Los Angeles, October 11, 1954.

Tests have been made, and are still in progress, by Gulf Oil Corp. using a bottom-hole recorder, to correlate surface-weight readings with loads measured between the bit and drill collars. So far, these tests have been made under a limited range of conditions of depth and hole deflection. When these tests are completed, the results may help answer some of the questions about the behavior of the drill string between the bit and the surface.

Considerable research work has been done by Petro-Mechanics Division of Borg-Warner Corp. with an electronic bottom hole recorder. However, correlation of bottom hole weights with surface weights was not attempted.

Under extreme conditions of hole deflection and drill-string compression, surface bit weight values may be distorted; however, until proved otherwise, we may assume those values to be correct, under normal conditions.

Good points and bad . . . A wide variety of weight-indicating equipment is now available to the contractor. The simplest types are mechanical or hydraulic units with integral gage which clamps on the dead line. These instruments give a continuous indication of hook loads. They have advantages of low initial cost, good portability, and simple installation. The disadvantages are high maintenance cost from line whip and vibration and poor readability.

Some of these objections may be overcome by remote location of the gage, with electric or hydraulic transmission from the dead line. This arrangement permits larger dial size with better readability, lower maintenance cost, and the feature of graphic recording. One such instrument is a hydraulic type taking a signal from a wire-line anchor. This operates on a direct pull on the load element and is not influenced by changes in fluid volume, temperature, or line diameter. The load-sensitive element in this system may be a stroking diaphragm, which eliminates friction from the load element. A schematic diagram of the unit is shown in Fig. 1.

Desirable refinements to the weight indicating gage are dials for direct reading of weight on bottom, in addition to hook loads, and a compound pointer for amplified reading of small weight changes.

Penetration vs. bit life . . . It is with bit weight and rotary speed data that the driller is required to resolve the economic problem of optimum balance between rate of penetration and bit life—the solution of which lies at some point between the following two extremes:

1. High penetration rates and short bit life resulting from heavy weight and high speed.

2. Low penetration rates and long bit life resulting from light weights and low speed.

Generally speaking, penertation rate will be a direct function of bit weight, up to the limit of balling the bit. Also, we may assume drilling rate to be a direct function of rotary speed. These

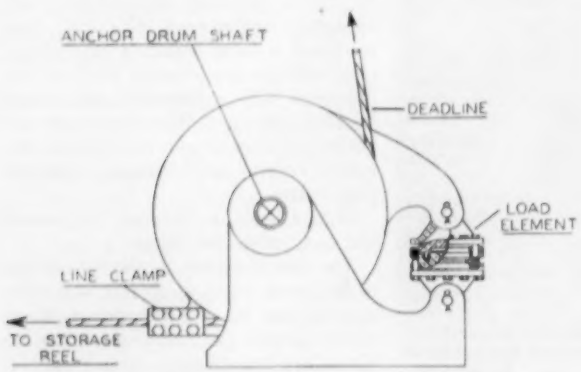


Fig. 1—Schematic wire-line anchor and load element.

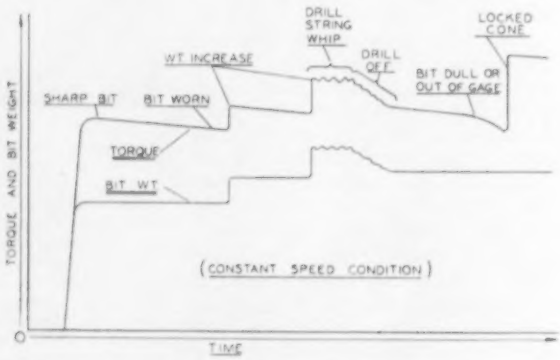


Fig. 2—Generalized torque gage interpretation.

generalizations will hold—within limits. One is that the weight must be sufficient to overcome the compressive strength of the formation.

There is, of course, an adverse result of increasing both weight and speed. Bit wear will increase much faster than the gain in penetration rate. If, however, a formation is found to require more weight to crush it rather than wear it out, the bit weight may be doubled, for example, and the speed reduced one-half, with no change in the bit life. In certain problem areas, bit weight as high as 90,000 lb. has been run.

Maintaining proper weight . . . Once the driller has established a compromise relationship between rate of penetration and bit weight, it should be closely maintained. At constant speed, overloading will shorten bit life out of proportion to footage gained. Underloading, which may be caused by drilling off, will lengthen bit life, but the additional rig time required to make footage may not be economical.

The importance of this has been established by operators making use of automatic feed devices. Automatic feeding is reported to be approximately 10 per cent faster than hand feeding with no more or even fewer bits used. Theoretically, the same results could be duplicated by hand feeding, except for the human fatigue factor.

Current automatic feed control systems are based on a constant weight principle, taking their signal from a surface-weight sensing element. In this application, it is important that the weight signal be sensitive and accurate, as well as temperature stable.

Other considerations . . . Hole drift and drill-pipe fatigue resulting from buckling are two other conditions affected by bit weight. These conditions may be controlled by keeping the bit weight below established critical values. If, for example, a bit weight has been selected which is close to the critical point, periodic overloading will result in periodic buckling with fatigue of the string and the possibility of drifting and caving of the hole.

Directional drilling may require a converse condition, wherein the bit weight should be kept above the critical value if deflection angle is to be maintained.

Fishing operations require sensitive bit weight indication and accurate hook loads to prevent overloading.

Hydraulic System Instruments

The rotary hydraulic system performs a vital service in maintaining the hole, holding back formation pressures, removing cuttings, etc. However, of great importance to the contractor is the function in cutting the hole. It is obvious that in very soft formations the well could be jetted down with nothing but gage cutters on the bit.

It is not so obvious that in hard formations as well, the mud supplies considerable destructive energy to the face of the hole. The energy available for this purpose is a function of mud volume and the open area of the bit nozzles, inversely. The pump supplies this energy, in addition to that required to overcome the other frictional losses in the system. The result depends on the available horsepower and the ability to impart that power to the mud stream.

Getting best results . . . To obtain the most effective result the driller should operate the pump, without overloading, at maximum speed and with maximum size liners. A mud-pressure gage at the driller's position is required for continuous check on pump performance. The gage should be sensitive to small pressure changes, but damped to stabilize the pointer at the mean pressure level.

Any sudden change in mud pressure should be detected and the cause determined. A pressure rise will usually be the result of a plugged bit. A pressure drop may be due to loss of pump speed, a cut pump valve, worn piston, joint washout, or other conditions.

A pump speed and volume indicator, when used in conjunction with the pressure gage, can aid the driller in keeping the pump operating near maximum performance.

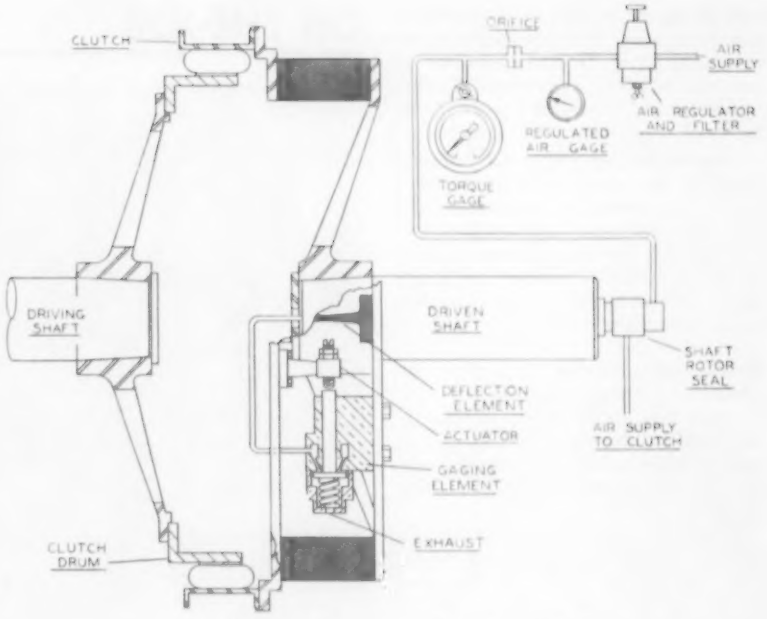


Fig. 3—Ideal torque meter schematic assembly.

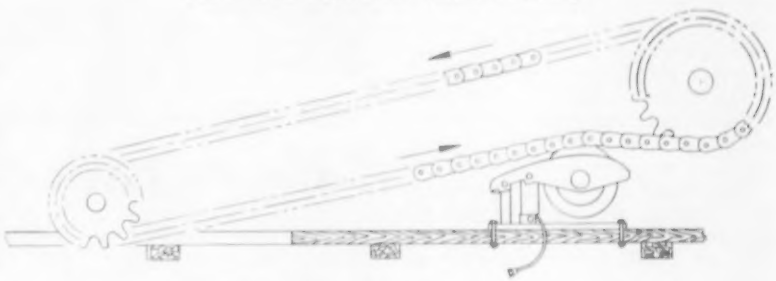


Fig. 4—Chain-actuated torque gaging unit.

Torque Gages

Torque gages of various types have been used for many years, the most common form being manifold pressure gages on steam or gas engines. This method has a serious lag and loss of sensitivity that prevents full effectiveness as a drilling control instrument. The development of improved torque-indicating methods has made the torque gage a practical and useful drilling control instrument.

One method developed for use with shaft-driven rotaries is shown schematically in Fig. 3. A special spider with flexible spokes drives the rotary clutch. The spokes deflect under load,

controlling the output of a pneumatic gaging element. This equipment is not well adapted to field installation but may be installed as original factory equipment and is suitable for calibration in absolute units.

Another method employs a deflected chain as the actuating force. This is transmitted through a chain idler to a hydraulic load cell. The equipment is adaptable to field installation either in the draw works or under the rotary chain. A schematic assembly of this unit is shown in Fig. 4.

Significance of torque . . . With improvements in torque instruments, drillers have become conscious of the application of torque information to many drilling problems, including coring, reaming, milling, and bit-condition determinations.

Net work being done by the bit can be measured by making a zero adjustment on the gage while the drill pipe is rotating off bottom. Bit condition from green to dull, as well as locked cutters or out-of-gage wear will be detected. Drillers quickly learn the technique of applying torque measurements as a drilling-control method.

Fig. 2 shows a typical weight—and—torque chart. These signals should be correlated as shown, for best interpretation of torque gage readings.

For special purposes, relative torque gage readings may be converted into foot-pound units. This can be done by deriving a conversion factor at the time readings are to be taken. A simple method is to apply a rotary tong to the kelly, and using a tong torque gage, correlate torque applied by the tong with the torque gage readings.

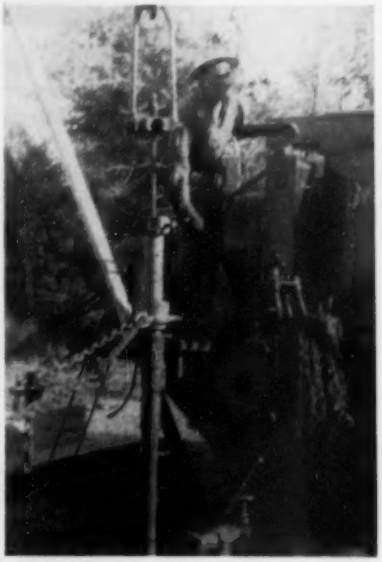
Rotary-Speed Measurement

The importance of rotary speed as it affects bit wear and rate of penetration is frequently underestimated. The driller should not be expected to count or estimate rotary r.p.m. (speed) because simple relatively inexpensive tachometers are available which eliminate the guesswork, making it possible to duplicate operating conditions.

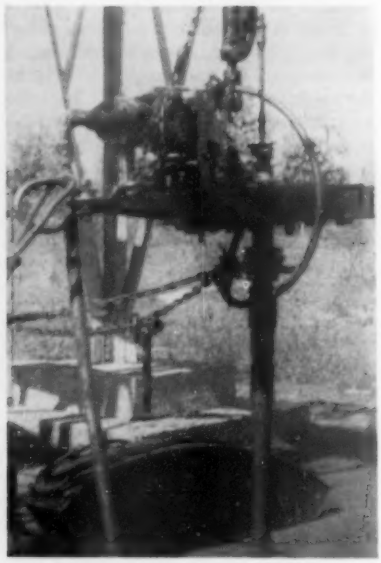
Many types are available to suit all rig designs. A cable-driven assembly is simple and dependable for short distances from takeoff to head. For transmission through lengths greater than 15 or 20 ft., an electric type is the best solution. These may be either generator transmitter or separately energized selsyns.

Rate-of-penetration measuring and recording instruments can furnish a useful record for comparative study of methods and tools. This record is most significant when correlated with the operating conditions of weight, speed, and mud pressure.

ON THE JOB . . . . . IN THE FIELDS



OPERATOR PREPARES to attach air tongs to the Curtis Safety Backoff Tool which has already been attached to the top of the tubing and to the rod.



POWER TONGS now are attached to the backoff tool and everything is ready for starting the backoff operation. Note the safety tieoff chain.

This new job-tested tool makes it . . .

Safer to back off sucker rods

A NEW tool has been developed to aid the once dangerous and time-consuming job of backing off stuck sucker-rod strings. Called the Curtis Safety Backoff Tool, the device has been evolved from field trials over the past 3 years in the Northeast Texas area. It is fitted for use with either power tongs or with an endless rope line.

The main advantages of the tool are in greatly speeding up the removal of the stuck rods and in removing almost all danger to the crew. It has not yet failed to back off a stuck rod string.

THIS MODEL of the safety tool uses an endless line for its power supply.

The tool allows the maximum strain to be taken on the stuck rods, insuring that unscrewing will take place at a greater distance down the well than could be expected with the old hand methods. Since rotation of the rods is continuous whether the endless line or the power tongs are used, the actual unscrewing time is held to a minimum.

The tool was designed primarily to prevent the injuries that are all too common in the hand-rotation method of backing off rods. Using the new device, no man of the crew is required to be in actual contact with it during operation. When employing the endless line, the operator of the pulling unit is 8 to 10 ft. away from the tool. The distance reduces the danger of a man being struck by wildly moving parts when the strain on the rods is suddenly released by the final unscrewing.

A special, small clamp fastens to the rod immediately above the well head, and is the only part of the tool that goes up when the rod is loosened. Special grooves guide the clamp back into place when it comes down. A ball-type ratchet permits instant reversing of tool for rotation in either direction, and a divider prevents the endless line from climbing on its drum.

Recent jobs . . . On a well in Yantis

THIS PIPE matches your needs and your budget

The 132 different diameter wall thickness combinations of Armco Welded Steel Pipe make it easy to get exactly the pipe you need. Diameters range from 6 to 36 inches; wall thicknesses from $^{9}/_{64}$- to $^{1}/_{2}$-inch.

By meeting your requirements, Armco Pipe affords real dollar savings. There is no need to settle for the "nearest larger size or thickness." You buy only the metal you need.

Here is something else. Long, 50-foot lengths of Armco Pipe mean there are fewer sections to handle for a given length of line. There are fewer joints to make, too. Forty-foot pipe, for example, would require 25 per cent more joints than Armco Pipe.

Armco Welded Steel Pipe is recommended for requirements in the Natural Gasoline and Natural Gas Divisions and wherever else you need dependable line pipe. Write us for complete data. Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 3794 Curtis Street, Middletown, Ohio. 201 KOME Building, Tulsa, Oklahoma. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

ARMCO WELDED STEEL PIPE

ARMCO

field, Wood County, Texas, the Curtis tool was recently employed by the Vick Well Servicing Co. Within 30 minutes after the tool was attached to the stuck string of rods, the job was completed. The farm boss for the major company which owns the well reported he was well pleased with the speed and safety with which the job was conducted.

On another well, 272 turns to the right were taken on a string of ¾-in. rods to free the pump stroke. In another case, the operators were able to back off a string 196 rods down the well. Only 15 joints were left above the pump, so it was necessary to use the safety tool a second time.

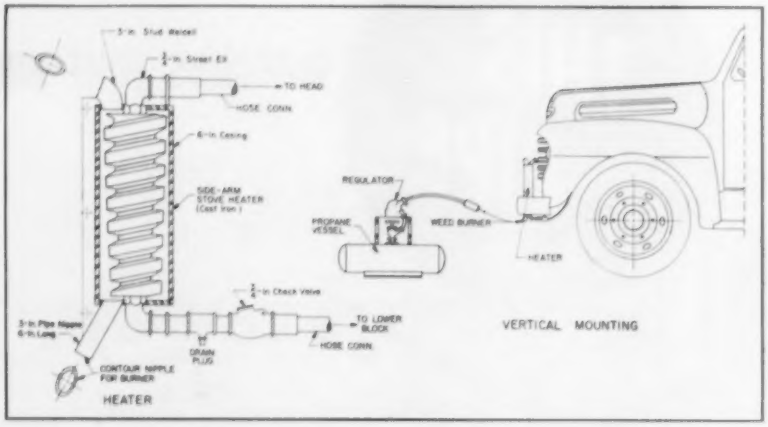
The Curtis tool was invented by Curtis Wall, who works for a major company in New Hope field, Franklin County, Texas.

Counterweight eases tong handling

AYERS & BURCH, contractors of Wichita Falls, utilize a simple counterbalance for the drill pipe tongs on one of their light rigs.

The line supporting the tongs goes up to a pulley attached to the mast, and down to a point near the ground where a suitable counterweight is hung. So that the weights will be clear of the working area, they are pulled away by a rope attached to a remote stake. The tongs will not rise any farther than a predetermined height when the counterweights hit the ground.

Location is the T. F. Hunter Estate 1 Dengen within the city limits of Holliday, Tex., in the Holliday field.



Weed burner speeds winter starting

A PORTABLE weed burner combined with a mounted hot-water heater makes an excellent engine heater to facilitate quick starting of engines in sub-zero temperatures. These units have been used successfully by crews of Phillips Petroleum Co. during winter operations in the Rocky Mountain region. The heater makes starting easier on the cold engines of trucks and tractors.

A weed burner using L.P.G., supplied from a standard 20-lb. bottle or tank, is easily transported in an automobile or pickup truck. The heater itself is a modification of the common household-sidearm-type hot-water heater. When mounted with connections to the cooling system, the heater causes circulation through the block and will warm the coolant, block, and oil within a few minutes.

In this illustration, the heater is shown in a vertical mounting, and that is preferable. But if the contour of the bumper will accommodate only a horizontal mounting, that is also permissible.

They keep a supply of dead men handy

ONE company in West Texas keeps a reserve supply of dead-men anchors made up in advance so that when a rapid series of new locations occur, there is no need for an excessive amount of welding time. The dead men are made from 4-ft. lengths of 4-in. pipe and 20-ft. lengths of scrap sucker rods. The rods are bent into the shape shown in the photo above and welded to the middle of the pipe. A small crossbar is added near the top bend to form an "eye."

One advantage of having the dead men made up ahead of time is that a hole of standard dimensions can be dug for them. It is then a simple matter to haul the required number of dead men to the location and drop them into the waiting holes.

No Need to Pay Extra for Monel Orifice Plates Like These — You can now get them from Odex at a price comparable to ordinary high alloy steels in either the universal or paddle shapes to fit standard meters. With Monel you can maintain accurate meter readings for longer periods under most conditions. Additional information and prices are available on request from Odex Engineering & Equipment Co., 1410 N. Grant, Odessa, Texas.

When you want accurate flow metering.....

"Keep your eye on the doughnut

and not on the hole"

It's the orifice that establishes a flow meter reading, of course.

But it's the orifice plate . . . the "doughnut" . . . that establishes the accuracy you want. When a plate is eroded or corroded, the hole is distorted. So is the accuracy of the reading.

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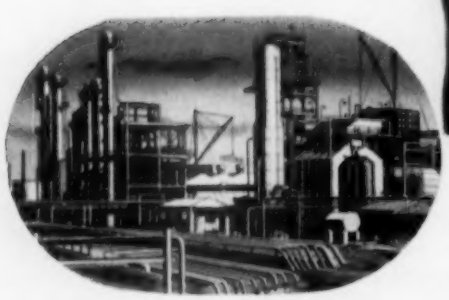

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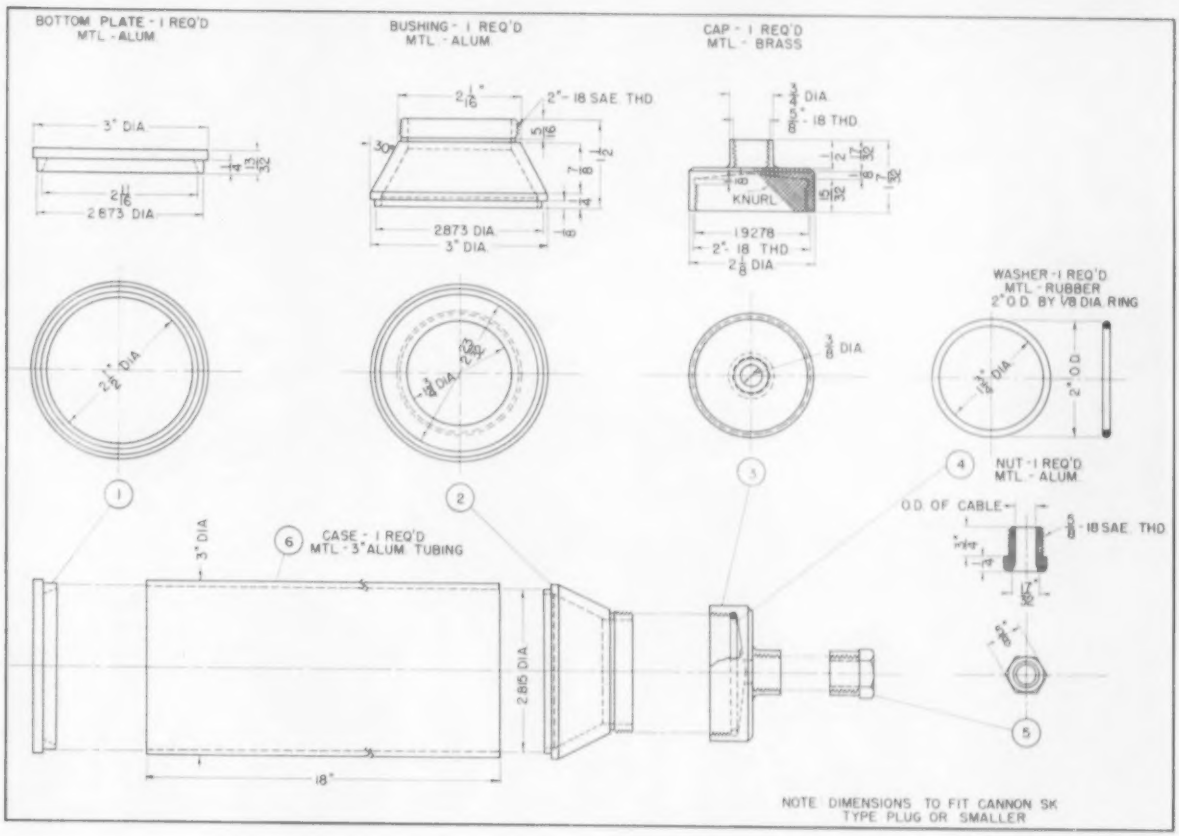
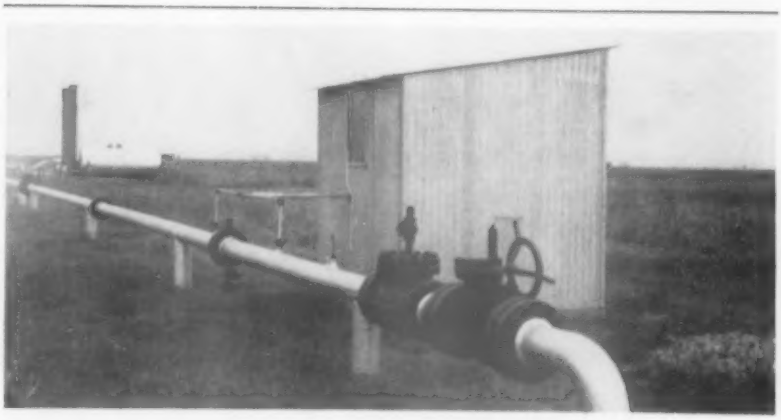


This will keep geophone-cable plugs dry

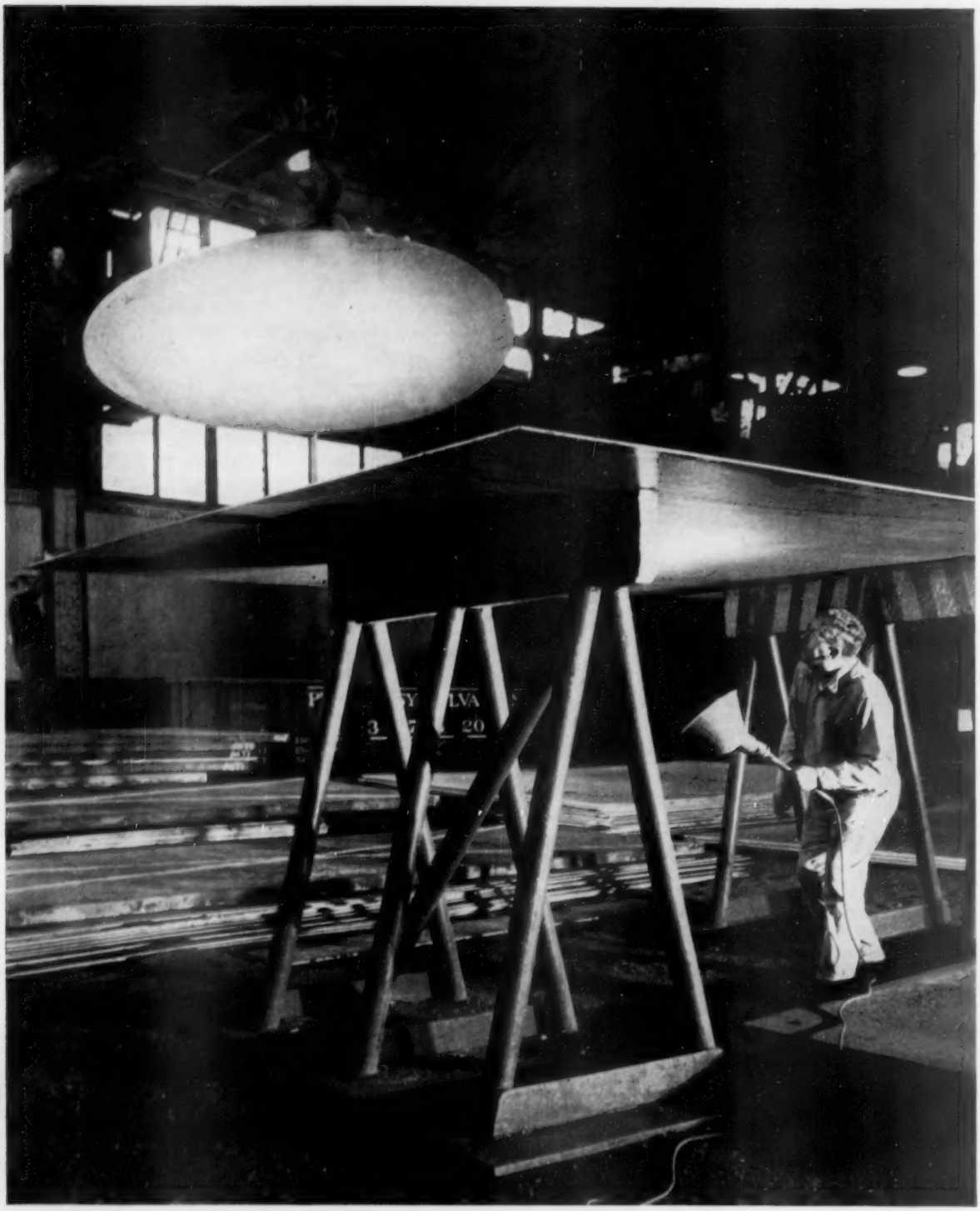
IN seismograph shooting on water, Phillips Petroleum Co. has in the past experienced some trouble with the geophone-cable plug accidentally falling into the water and getting wet. Inasmuch as it is imperative that these plugs be kept dry to eliminate cross-feed and low-quality first breaks an aluminum canister or water-tight cover has been used as shown on the attached sketch to keep these critical plugs dry in water operations.

The use of this improved cover has resulted in better-quality records, as well as time and materials saved in maintenance. The canister or cover may also be used as a buoy to mark the location of the cable and eliminate the danger of getting the boat propeller tangled with the geophone cable, which can cause considerable damage to the cable. It also allows the geophone planter to work ahead of the recording unit, which helps to speed up the shooting operation.



Safer place to set a meter house

ONE company on the Gulf Coast does not place the meter house over the meter run, but sets it to one side with just the pressure-recorder lines entering. The house is spacious and does not collect gas which even minute leaks in the orifice flange will pass. To prevent freezing, the control lines slope toward the orifice flange so there are no pockets of liquid.



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by
Harold Woodhouse

Series vs. Parallel Arrangement of Centrifugals for Gas Pipeline Stations—3

Maximum efficiency and impeller sizes will be discussed in this concluding installment of the series.

ALL centrifugal pipeline compressors now in use run between 3,600 and 5,000 r.p.m. with possibly some overload running up to 5,500 r.p.m.

The average multiunit centrifugal station has an over-all station pressure ratio of about 1:30. The impellers run at 384 to 520 ft. per second tip speed and their diameters in the range of 29 to 36 in. Even some of the latest stations with 5,000 r.p.m. centrifugals do not exceed 500 to 550 ft. per second impeller tip speed.

Now, to develop a pressure ratio of 1:30 in one stage handling a typical natural gas will require approximately a 37-in. diameter impeller running at 5,000 r.p.m., or, in terms of tip speed, 810 ft. per second. This assumes that a typical radial-discharge-type impeller is used having backward-leaning vanes. It excludes the milled-from-solid-forging type which has not been manufactured in such a large diameter to date.

We see then, first of all, that the tip speed would be 60 per cent higher than those presently used. This will have an adverse effect on efficiency because efficiency declines as the tip speed is increased. This is partly due to increased gas velocities throughout the machine resulting in more friction and turbulence losses; and partly to greater impeller-disk friction losses and journal and thrust bearing losses.

Secondly, a 37-in. diameter is very large. It would not be feasible to provide room in the compressor for a much larger impeller to increase the pressure ratio. So, one could not count on increasing the station throughput by the simple expedient of changing impellers to get a greater pressure ratio.

Even if it were possible to install a larger diameter impeller or to increase the r.p.m., the increased impeller tip speed would further depress the peak efficiency.

Author is chief engineer, Dean Hill Pump Co., and consultant on compressor design.

Impeller construction . . . Impellers have been made for pipeline-station use by fabricating with an all-riveted construction; by casting the vanes to one side disk and riveting the other side disk; by using all-steel castings; by welding side disks and vanes; and by machining the complete impeller from a solid forging.

Riveted construction is used in industry, other than pipelines, up to about 770 ft. per second. Failures of riveted impellers have occurred in pipeline stations at conservative tip speeds of 480 to 500 ft. per second.

Getting a good cast-steel impeller is quite a problem. Even when a good one is obtained it requires many hours of filing on the vane passages because of the necessity for obtaining high efficiency. Some portions of the vane passages may be, and generally are, quite inaccessible for filing. Its reliability much in excess of 750 ft. per second is questionable.

The welded construction has been used on relatively small-diameter, large-capacity, mixed-flow impellers where the vane passages were fully accessible on the inside edges of both side disks. The method is not applicable to the large-diameter impeller with its inaccessible vane passages.

The completely machined-from-solid-forging type would be very expensive in such a large-diameter impeller, but the chief reason for not using this type is that it is basically a high specific-speed impeller and therefore not suited to the parallel-flow application.

There are difficulties then in producing such a large diameter, high tip-speed impeller.

If there are η centrifugals in parallel, the flow through each compressor is $1/\eta$ of the total flow. Both with centrifugal pumps and compressors, the maximum efficiency attained is a function of the volume flow. This is logical since with the larger flow a smaller proportion of the gas is subject to frictional contact with the passage walls and vanes and the recirculation proportion is smaller. Therefore, the efficiency of the compressor in parallel operation will suffer, not only because it is operating at a higher tip speed but also because its volume flow is severely reduced in a multiunit station over what it would be if in series.

Ease of adding units to increase flow . . . If, in a station with four existing centrifugals, one should want a moderate increase in flow, one more unit could be added to a series arrangement relatively simply. But if it were a parallel arrangement, one would have to put an extra unit in series with the whole station.

Since one would not like to be entirely dependent on the reliability of one particular machine, it would really be necessary to add two machines with added piping, check, and gate valves to be sure of having the extra pressure ratio always available.

This points up another disadvantage: to provide the extra pressure ratio of one machine in series with the parallel arrangement, it would be necessary to speed up every machine to provide the full pressure ratio of this one machine if it failed. But for the failure of one machine in a series arrangement of η machines, each one need only be speeded up to provide $1/\eta$ of the extra pressure ratio required.

The chief advantage advanced for the use of the parallel arrangement is that the centrifugals become smaller and cheaper.

This advantage is considerably nullified because the necessity for using a large-diameter impeller to produce a much-larger pressure ratio means that the base circle for the volute is actually greater than a full-flow machine. Only the cross-section of the volute will be smaller. In addition, the impeller will be heavier and, because it is running at a higher speed, the shaft may have to be larger in diameter on these two counts in order to maintain the requisite margin between running speed and the critical speed. In any event, the surface rubbing speed of the journal and thrust bearing faces is considerably increased, thereby adding to the possibility of bearing failure.

The conclusion is that the odds are heavily weighted against the use of centrifugals in parallel on pipeline systems.

QUESTIONS ON TECHNOLOGY

Penalty for High-Sulfur Crude Oils

by W. L. Nelson

"In your answer of August 16, 1954, page 150, you suggested a corrosion cost of 12 cents per barrel when handling high-sulfur crude oils. Are there not other costs that can be charged against high-sulfur oils?"—S.P.M.

Most certainly, high sulfur causes other difficulties than corrosion, mainly those associated with high-sulfur middle distillate, high-sulfur residual fuel oil, and poor-lead-susceptibility gasolines. In the answer of August 16, 1954, the cost of the corrosion due to high sulfur alone was found to range from a low of 6 cents to as high as 21 cents per barrel. Likewise, the Question on Technology of September 13, 1954, page 138, suggested a penalty of 2-6 cents per barrel of fuel oil (0-2 cents per barrel crude oil) for high-sulfur (2-6 per cent sulfur) residual fuels.

One means of handling high-sulfur middle distillates is to mix the high-sulfur distillates with low-sulfur distillates derived from a low-sulfur crude oil that is also processed. If this is not possible, then the high-sulfur distillates may be sold at a discount (e.g., as No. 2 distillate rather than as diesel fuel), they may be cracked, or in the extreme they might be catalytically desulfurized. These several means of disposal are compared in Table 1.

Diesel fuel having a diesel index of 48-52 has sold in cargo lots on the Gulf of Mexico since 1933 at a price about 5.4 cents per barrel above the price of No. 2 distillate. At inland points the difference is greater and it is also greater if perchance the distillate material has a higher diesel index than 48-52. Likewise, low-sulfur No. 6 fuel oil (usually below 1 per cent sulfur) has sold since 1951 at New York Harbor at 12-13 cents per barrel less than "unlimited sulfur" No. 6 fuel. Catalytic desulfurization (see last column of Table 1) will reduce the sulfur content but at a cost of 30-50 cents per barrel of charge stock or 5-18 cents per barrel of crude oil.

The sulfur content of the straight-run gasolines from high-sulfur crude oils is usually not too high to meet specifications, but when mixed with the cracked gasolines, the susceptibility of the whole gasoline mixture to tetraethyl lead is poor. Such gasolines require 0.5-1.0 cc. extra TEL fluid per gallon (The Oil and Gas Journal, Refiner's Notebook No. 63, October 13, 1945, page 145) and accordingly the extra cost of such leading is:

Per cent gasoline in crude oil		Approx. A.P.I. of crude oil	Cents per barrel extra for TEL					
			Sr. gasoline		Cracked		Total	
Straightrun	Cracked		0.5 cc.	1.5 cc.	0.5 cc.	1.5 cc.	0.5 cc.	1.5 cc.
12	25	15	0.7	2.3	1.6	4.7	2.3	7.0
19	35	25	1.2	3.6	2.2	6.6	3.4	10.2
29	49	35	1.8	5.5	3.1	9.9	4.9	14.8

All of these costs, namely (1) disposal of distillates, (2) penalty for high-sulfur fuel, (3) gasoline of poor lead susceptibility, and (4) corrosion due to high sulfur alone, are summarized in Table 1 for four modes of operation. Thus for the most fortunate situations, the extra costs of handling high-sulfur oil may range from only 8 to 12 cents per barrel whereas the cost may mount to over 30 cents per barrel when handling the highest-sulfur oils when conducting a large amount of cracking, or when catalytic desulfurization is adopted. The general effect of the amount of sulfur seems to be somewhat as follows:

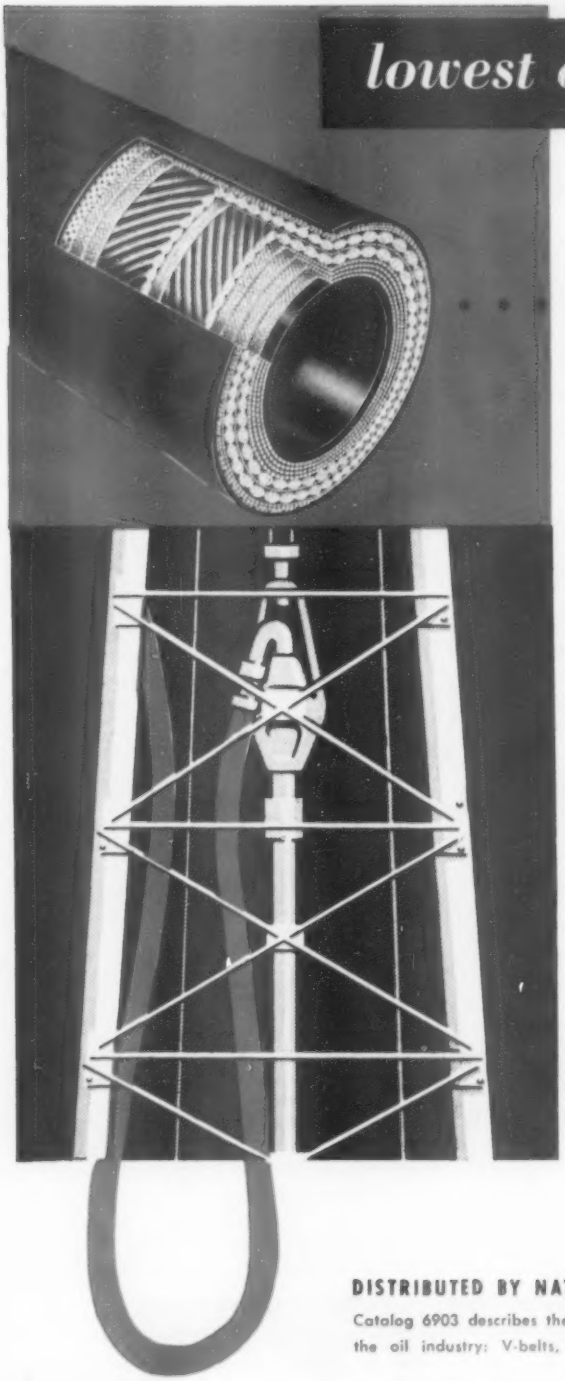
Per cent sulfur in crude oil	Extra cost, cents per barrel in handling high-sulfur crude oil
0.45-0.6	3 (1- 6)
0.6 -2.0	13 (8-20)
2.0 -4.0	17 (12-24)
4.0 -6.0	24 (19-35)

TABLE 1—COMPARISON OF THE EXTRA COSTS THAT ARISE BY THE PROCESSING OF HIGH-SULFUR CRUDE OILS*
(Cents per barrel)

Penalties for—	A Processing along with a low-sulfur crude oil	B Sales at discounts	C Complete cracking for max. gasoline	D Special desulfurization of middle dist.
Middle distillates (15-32 per cent of crude oil):				
(a) Mixed with low-sulfur distillates	Zero			
(b) Sale of diesel fuel as No. 2 distillate		0- 2.2		
(c) Special desulfurization treatment				5.0-18.0
(d) Cracked, not sold			Zero	
Residual fuel (15-40 per cent of crude oil)	0- 0.5	0- 1.0†	0- 2.0†	
(a) If part of cracking feed is desulfurized				0- 1.0†
Gasoline of poor lead susceptibility:				
(a) Low yield (20-45 per cent of crude oil)	1.0- 5.0	1.0- 5.0		0.5- 5.0
(b) High yield (35-70 of crude oil)			3.5- 7.8	
Corrosion due to high sulfur alone	7.0-14.0	7.0-14.0	9.0-19.5	7.5-17.0
Total extra cost, cents per barrel	8.5-18.0	8.5-20.5	13.0-27.0	14.0-29.0

*If the oil is "sour" as well as high in sulfur, an additional charge is necessary. See Questions on Technology, The Oil and Gas Journal, January 26, 1953, page 403. †If the sulfur compounds in the crude oil are extremely stable, such as in oils from the Middle East, Venezuela, Mississippi, and some from Arkansas, the residual-fuel penalty may approach the maximum of 2 cents per barrel.

lowest cost per foot drilled



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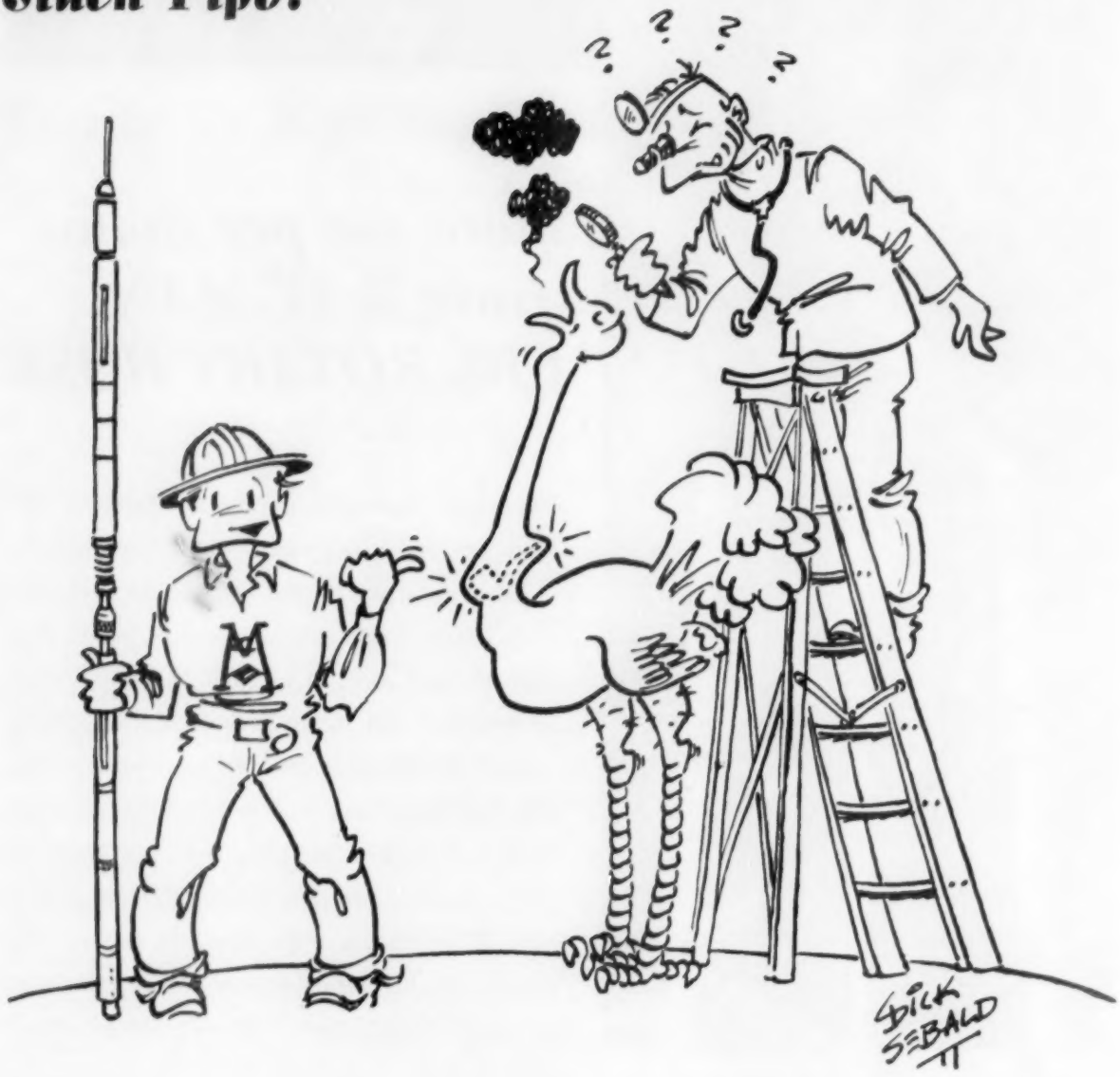

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ELECTRIC LOGGING: 43

Logging With Selective S.P. Curves

BECAUSE the S.P. curve for limestone is often difficult to analyze, a new departure in this field was the development of a selective S.P. curve. This log gives an accurate determination of permeable beds, even in highly resistive formations, except when the salinity of the mud is extremely high. Fig. 1 shows the electrode arrangement used. It is similar to the limestone device, and in fact usually is the same, even so far as dimensions are concerned. Two curves are obtained in this instance and will be described in turn.

The device shown in Fig. 1 is first considered to be situated in the shale, sufficiently above the limestone to be beyond its influence. In this position, and with no current flowing from electrodes A-A′, the potential at G-G′ is equal to the static S.P. of the shales. This potential is noted. The potential in the mud opposite the shale is constant so that the difference in potential between M and G-G′ is zero. The selective S.P. is the difference in potential between M and G-G′, and is zero in this case.

The device is then lowered while the potential of G-G′ is maintained constantly equal the static S.P. of the shales by means of a monitoring current passed through electrodes A-A′. When the device reaches the position shown in Fig. 1, the S.P. current flowing in the well bore at this location tends to lower the potential at G-G′. A monitoring current of the appropriate intensity and sign has to be passed through A-A′ in order to keep the potential at G-G′ equal to the static S.P. of the shale.

Current flows as in Fig. 1. No current can flow in the well bore between G and the shale because the potentials at G and in front of the shale have been kept equal. Above electrode A, therefore, the current flow is entirely within the cable in the conductor connecting electrode 5 to electrode A. From A to A′ the current flows in the low-resistance conductor which connects them to each other. From A′, downward to the permeable bed, the current flows in the mud column. The current penetrates the permeable bed to a great distance until sufficiently large cross-sections are offered by the resistive formations that the resistance is low enough. From there on it flows through large volumes of rock to the return electrode 5.

Intensity of the monitoring current is such that the potential at G-G′ is kept constant. As the device is lowered further, the path of the current from A′ along the bore hole becomes shorter, and the resistance offered to the current decreases. To maintain the same potential, intensity of the monitoring current has to be increased progressively.

Potentials at M and G-G′ remain equal, however, whatever the intensity of the current leaving A′ because there is no exchange of current between the mud and impervious limestone (assumed to be infinitely resistive). The selective S.P. will, therefore, remain equal to zero opposite the dense rock.

When the device reaches the level of a thin permeable bed, and when electrode G′ crosses the bed as shown in Fig. 2, part of the current flows from A into the well bore towards the beds. The other part continues to flow through the conductor to A′, and thence through the bore hole to the permeable bed. The potential at M is now less than at G-G′ because of the potential drop in the mud so that a negative signal is recorded.

As the device is lowered further, the signal reaches a maximum when M is opposite the center of the bed and then decreases again in a corresponding manner. The boundaries of the peak are located at a distance from the boundaries of the layer equal to half the distance G-G′. The width of the deflection is therefore equal to the thickness of the bed plus approximately the over-all length of the device.

In the case of a thin bed, in highly resistive formations the peak has a triangular shape. When the device is opposite a thick permeable bed, a plateau is obtained and the width is again equal to the bed thickness plus the over-all spacing. When the device is opposite a thin shale in the limestone, no current can flow into the bore hole from the shale because the potential of electrodes G-G′ has been made equal to that of the shale.

Selective S.P. Curve No. 1 will, therefore, give zero readings in front of shale and dense limestone, but will give negative peaks in front of permeable beds.

Author is assistant professor of petroleum engineering, Missouri School of Mines and Metallurgy.

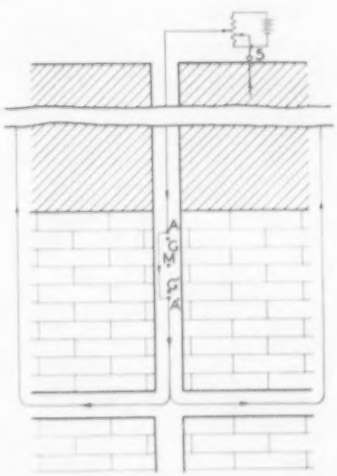

Fig. 1—Electrode arrangement for selective S.P. curve. This log gives an accurate determination of permeable beds, even in highly resistive formations, except when the salinity of the mud is extremely high.

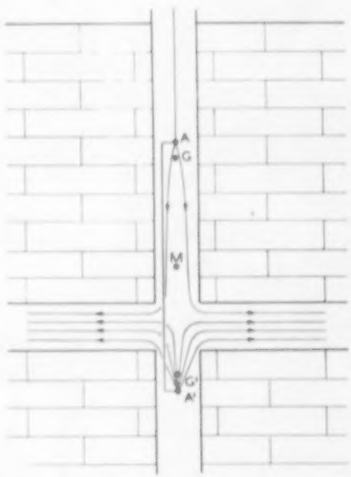

Fig. 2—When the electrode G′ crosses a thin permeable bed, part of the current flows from A into the well bore toward the beds. Both figures from Doll, "Selective S.P. Logging," Trans. A.I.M.E., Vol. 189, 1950, p. 130.

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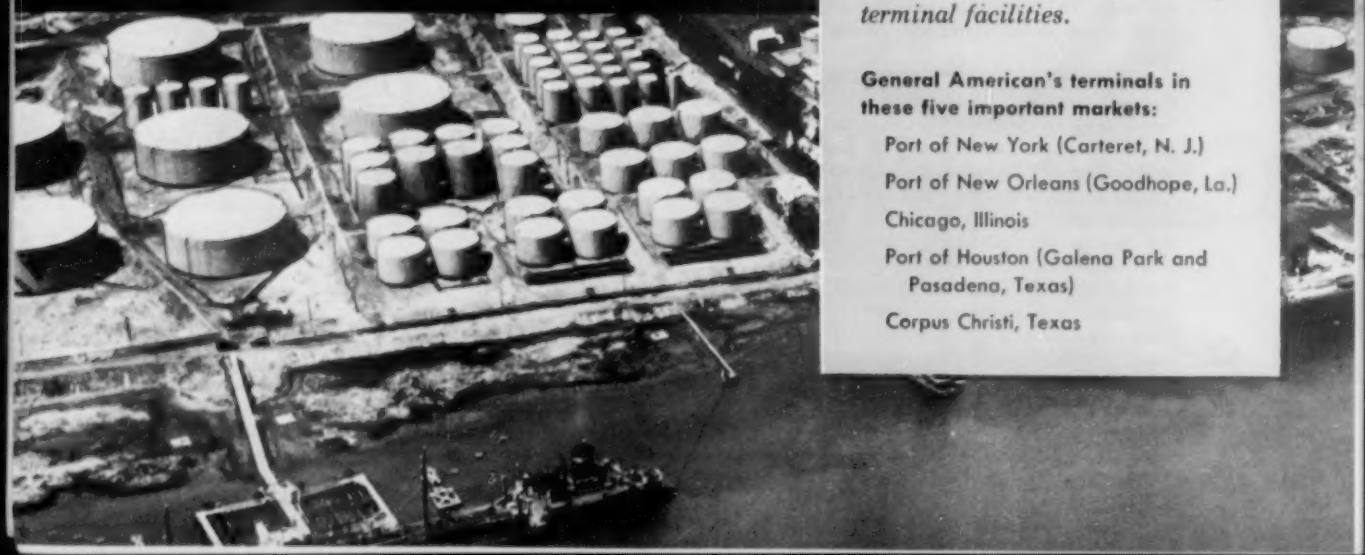

How to Design In-Tank Jet Mixing Systems—8

HERE are the remaining calculations for mixing TEL with gasoline as continued from the last installment. The nomogram below is the second of a group to be continued in later issues.

H. Find actual total circulating time (start of blend to end of circulation)

Case 1: If desired TEL addition time is less than one-half calculated mixing time:

16. Actual total circulating time = calculated mixing time, 15 —hours, —minutes

Case 2: If desired TEL addition time is greater than one-half calculated mixing time:

16. Actual total circulating time = blending time, 6, plus one-half calculated mixing time, 15 1 hour, 14 minutes

I. Use Fig. 7, knowing 14 and 4, find:

17. Nozzle diameter, in. 1.3

J. Use Fig. 8, knowing 4 and 17, find:

18. Nozzle thrust, lb. 46

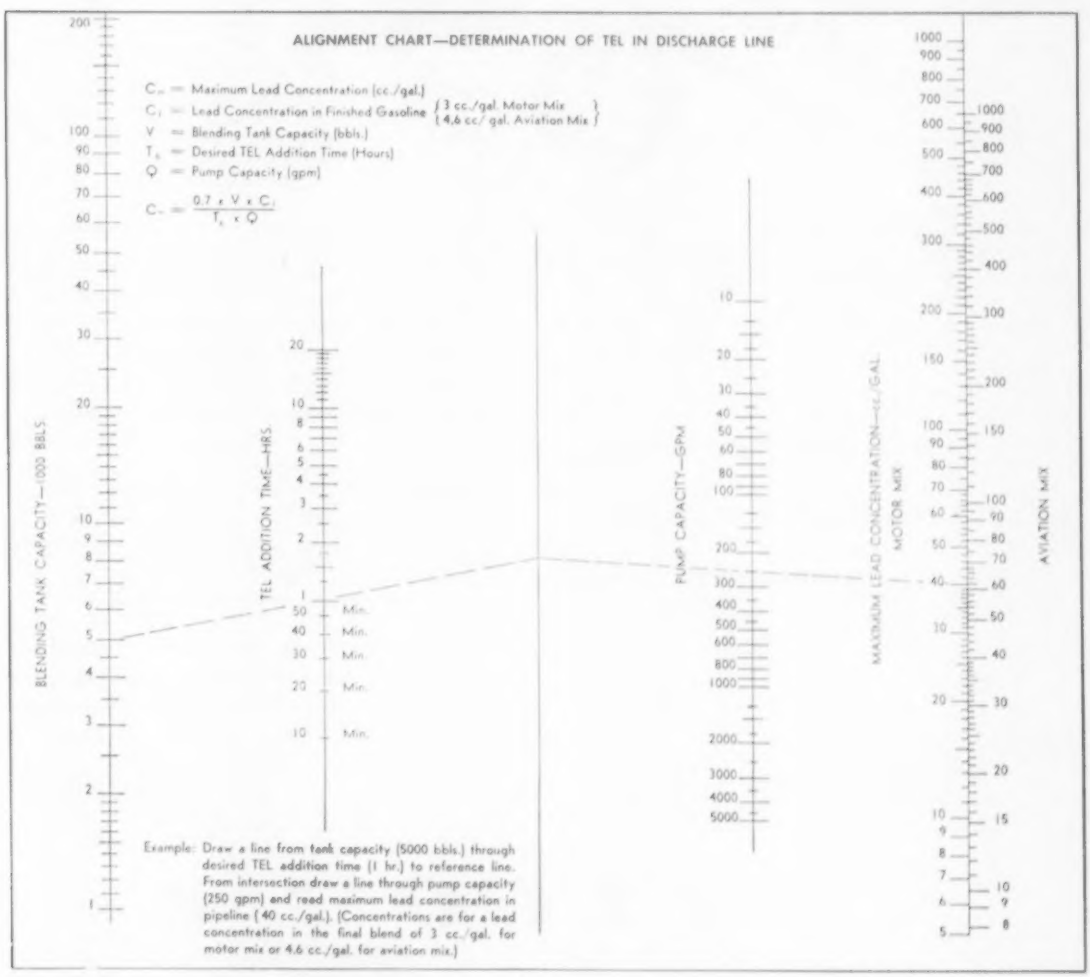
ALIGNMENT CHART—DETERMINATION OF TEL IN DISCHARGE LINE
C_m = Maximum Lead Concentration (cc./gal.)
C_l = Lead Concentration in Finished Gasoline { 3 cc./gal. Motor Mix / 4.6 cc./ gal. Aviation Mix }
V = Blending Tank Capacity (bbls.)
T_a = Desired TEL Addition Time (Hours)
Q = Pump Capacity (gpm)
$C_m = \frac{0.7 \times V \times C_l}{T_a \times Q}$
BLENDING TANK CAPACITY—1000 BBLS.
TEL ADDITION TIME—HRS.
PUMP CAPACITY—GPM
MAXIMUM LEAD CONCENTRATION—cc./GAL.
MOTOR MIX
AVIATION MIX
Example: Draw a line from tank capacity (5000 bbls.) through desired TEL addition time (1 hr.) to reference line. From intersection draw a line through pump capacity (250 gpm) and read maximum lead concentration in pipeline (40 cc./gal.). (Concentrations are for a lead concentration in the final blend of 3 cc./gal. for motor mix or 4.6 cc./gal. for aviation mix.)

Fig. 4.

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Applying Spectroscopy in Petroleum Analysis—5

by R. C. Pomatti, R. F. Meeker, and Harry Levin

THE preparation of samples for excitation is one of the most critical steps in emission analysis. Most of the samples encountered in a petroleum laboratory are liquids; those that are solids are generally nonconducting and usually must be placed directly in cratered graphite electrodes or mixed with a buffering material, such as graphite powder. Oils are analyzed by direct or indirect methods.

In direct analysis the oil itself enters the arc or spark column. (Fig. 13 shows the electrodes used in two direct techniques—the porous cup and rotating electrode.) Another direct method employs graphite electrodes which have been heated to redness, quenched in the oil sample, and the electrodes then sparked.

With indirect techniques the metallic elements in the oil are first concentrated by coking or ashing. This residue, alone or mixed with a buffer, is placed in a cratered electrode and subjected usually to a d.c. arc. Another technique makes use of a rotating graphite platform on which about 0.5 ml. of oil has been vaporized. (Fig. 14 shows this type of electrode.)

This material from E. I. du Pont de Nemours Co., Inc.

There are other methods of sample preparation, but the above with modifications are the ones usually used.

Emission analysis is widely used in identifying contaminating elements in deposits, sludges, used greases, and oils to determine possible causes for trouble encountered and to indicate what corrective action should be taken. For example, a large amount of silicon (due to road dust or chromium or water-treating compounds) found in the crankcase oil of an engine may indicate faulty filtering action or cooling-system leakage.

Spectrographic analysis of lubricating oils for additive elements is a fairly common practice in petroleum laboratories today. It is used both for control analysis in blending operations and in determining additive concentration in used oils.

Another interesting application of emission analysis is the possible use of the spectrograph in maintenance problems of diesel locomotives. Spectrographic analysis of used diesel oils has aroused considerable interest in railroad circles. At least a dozen railroads, as well as major locomotive builders, have added spectrographic equipment to their laboratories.

Since determination of several elements in the order of a few parts per million or less is required, the spectrograph provides a convenient, relatively rapid, and often the only economically practical means of analysis. A number of variables enter into the use of the spectrograph as a maintenance tool and must be considered before reliable conclusions can be drawn.

The spectrograph has wide use in connection with several refinery operations. Some crude oils contain significant amounts of a number of trace metallic elements. Important among these are vanadium and nickel which influence product yield and cracking catalyst efficiency. The spectrograph is used extensively to analyze crude oils, charge stocks, and catalysts.

A related application of the spectrograph is in the analysis of residual fuel oils, where most of the trace metals of the crude is concentrated. When these residual fuel oils are used as fuel in high-temperature boilers and turbines, excessive quantities of some of the trace metals may cause troublesome deposits, slag, and pitting. In some diesel engines, these elements may sometimes contribute to deposit formation on pistons and cylinders.

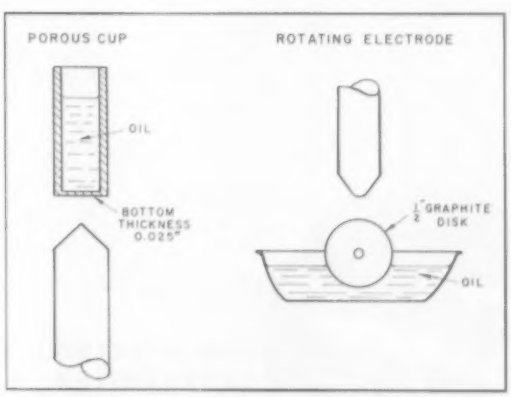

Fig. 13—Porous cup and rotating types of electrodes used in direct spectroscopic analysis.

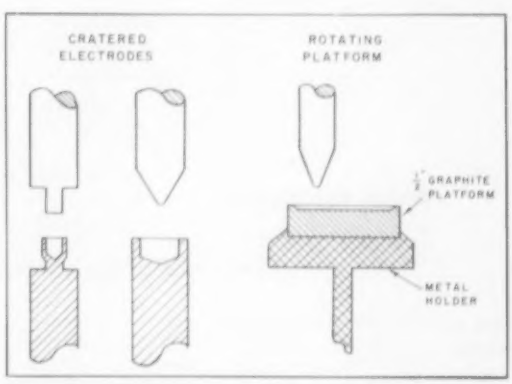

Fig. 14—Cratered and rotating platform types of electrodes are used in indirect analysis.

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UNSTEADY STATE FLOW IN GAS RESERVOIRS—2

Solving a Special Case of the Diffusivity Equation

NUMERICAL solutions of diffusivity equations were obtained by Bruce, Peaceman, Rachford, and Rice[1] for constant efflux at one boundary with other boundary closed. In order that results might be general, they were given in terms of "reduced" or "dimensionless" quantities. Reduced pressure P is the pressure given as a fraction of the initial pressure. The reduced efflux rate is defined for linear system by:

$$Q = \frac{2\ m\ L\ \mu\ R\ T}{p_i^2\ K\ a} \qquad (1)$$

In practical units: m is the efflux in pounds moles per day (1 mole = 379 standard cu. ft.), μ is the viscosity in cp., L is the length of system, ft., R is the gas constant, 10.72, T is the temperature of system, °R., p_i is initial pressure, psia., K is permeability in perms (6.3 times permeability in darcies), a is the cross-sectional area, sq. ft.

The reduced distance is X = x/L, where x is actual distance in feet.

Bruce et al. plotted reduced pressures against reduced distances for a series of reduced rates and fractional depletions F (fractions of original reservoir contents removed). For the linear case, see Fig. 1. For convenience, reduced pressure drops, 1 — P, are plotted instead of reduced pressures P. Only terminal-reduced pressure drops are given. A curve of P vs. X may be approximated from the observations that the slope is zero at the closed end (X = 1) and that the curve passes through point P = 1 — F at X = 0.4. The curves assume that the system was originally at a uniform pressure p_i. Dot-dash lines show when the transient boundary beyond which there is essentially no pressure drop has reached the points X = 0.5 and X = 1.0.

To illustrate use of values of Bruce et al. (Fig. 1), consider a linear gas reservoir closed at one end and produced by a row of wells at the other. The reservoir is 3,000 ft. long and 5,000 sq. ft. in cross-sectional, temperature is 550° R., and initial pressure is uniform at 1,500 psia. Permeability is 200 md. (1.26 perms), porosity is 18 per cent, and gas viscosity is 0.015 cp. If the wells are suddenly opened and the reservoir is produced at the rate of 10 million s.c.f.d., calculate:

1. How long does it take for the transient to just reach the other end?

2. Neglecting radial effects near the wells, what is pressure near the producing end and at the closed end when 30 per cent of the original contents have been removed?

Reduced rate Q is:

$$Q = \frac{2 \times 10^7 \times 3{,}000 \times 0.015 \times 10.72 \times 550}{379 \times 1{,}500 \times 1{,}500 \times 1.26 \times 5{,}000} = 1.0$$

On the curve for Q = 1 we find that the transient has reached the far end when the fraction removed is 0.04. The reservoir originally contained:

$$\frac{0.18 \times 3{,}000 \times 5{,}000 \times 1{,}500 \times 520}{14.7 \times 550} = 2.6 \times 10^8 \text{ s.c.f.}$$

Hence, the transient reaches the closed end in $0.04 \times 2.6 \times 10^8/10^7$ or 1.04 days.

When F = 0.30 the terminal-reduced pressures are 1 — 0.56 and 1 — 0.20 or 0.44 and 0.80. Multiplying by 1,500, the actual terminal pressures are 660 and 1,200 psia. The pressure at 0.4 reservoir length or 1,200 ft. from producing end is 0.7 × 1,500 or 1,050 psia.

It is of interest to compare the time required for the transient to reach the other end, as found from Fig. 1, with that calculated on steady-state pressure distribution in the transient. An equation derived from the latter assumption is, if terminal pressure is low compared to reservoir pressure:

$$t = \frac{2/3\ \mu\ L^2\ f}{(K\ p_i)} \qquad (2)$$

where f is the porosity. Substitution of values of this problem in Equation 2 gives 8.5 days. **Thus strict solutions of the diffusivity equation show that the transient moves faster than predicted on assumption of steady-state pressure distribution.**

The diffusivity equation assumes, in addition to isothermal flow, the validity of Boyle's and Darcy's laws. Solutions are therefore not valid if large variations in supercompressibility factor or turbulent flow are involved.

References

1. Bruce, Peaceman, Rachford, and Rice, Petr. Trans., A.I.M.E., Vol. 198, p. 79, 1953.

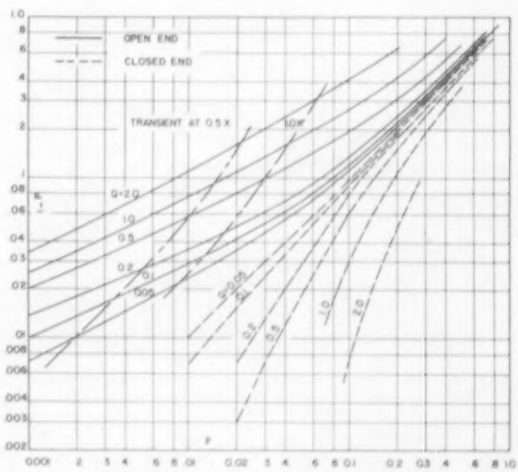

Fig. 1—Terminal reduced-pressure drops, 1 — P, as a function of fractional depletion F for various reduced-efflux rates Q. (Dot-dash lines show 1 — P and F for each Q, when transient boundary has just reached halfway and all the way to the closed end.) From Bruce et al.[1]

Author is associate professor of petroleum and natural-gas engineering, Pennsylvania State University.

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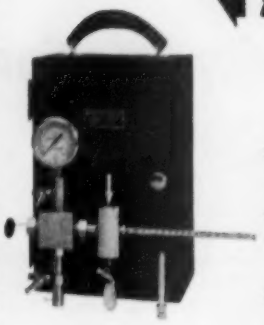

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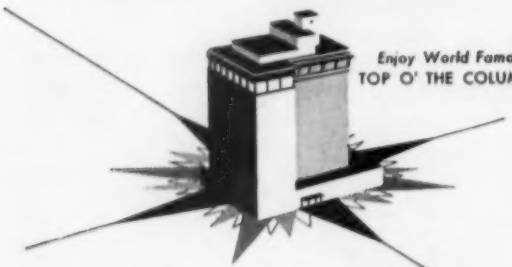

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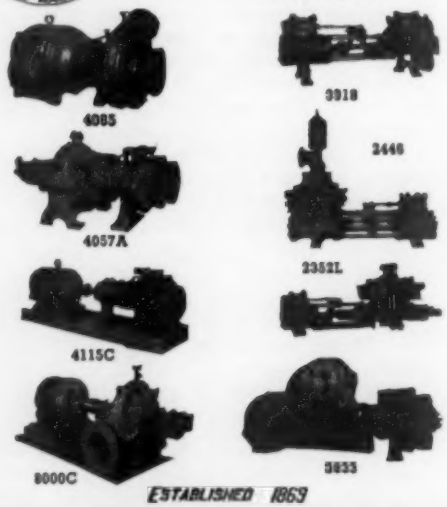

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Ammonia Plant Set

U. S. Steel to add to fast growth with Utah facility

PITTSBURGH.—The recent announcement by Blaw-Knox Co. that it is planning a 200-ton daily ammonia plant for United States Steel Corp. at its Geneva, Utah, plant brings to 26 the number of ammonia plants and expansions due to be completed by 1956.

The U.S.S. plant will utilize coke-oven gas as a feed stream; however, the addition of this plant does very little to change the percentage of ammonia plants using natural gas as a feed stock. Figures now show that approximately 70 per cent of all synthetic ammonia derives its hydrogen from natural gas.

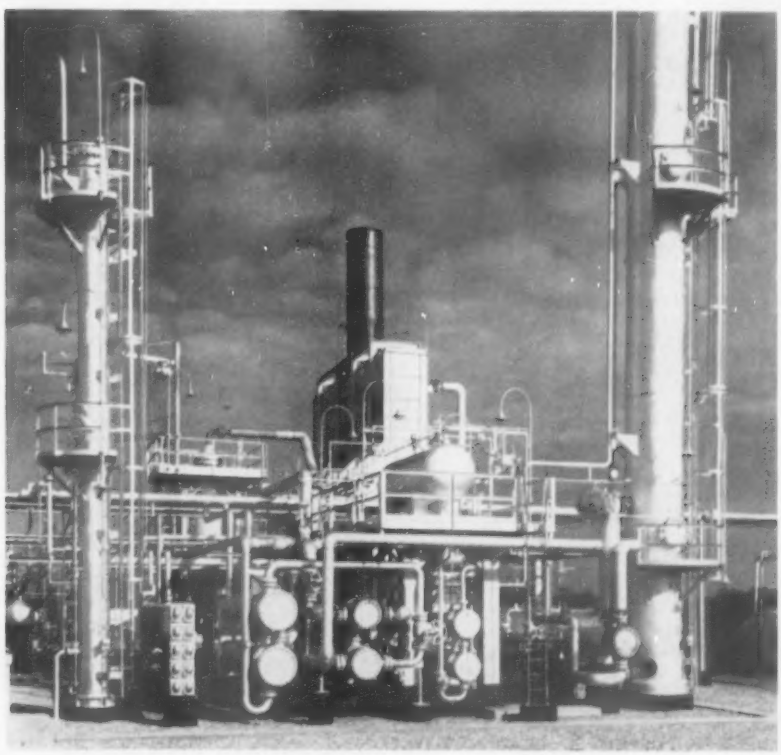
At the present time, 26 additional plants and expansions are slated to add approximately 1,400,000 tons to the annual ammonia capacity. During the 44-month period from January 1950 to September 1954, 18 plants and expansions added 1,045,000 tons annually of capacity. These figures were reported recently to the South Texas Section of American Institute of Chemical Engineers by Dr. C. H. Davenport of Lion Oil Co.

The new facilities will be concentrated in 22 states of the South, Mid-Continent, Northeast, and West. The Southeast, a large fertilizer-consuming area, has no plants being built because of a lack of abundant hydrogen stock.

The major producing regions are broken down as follows:

1. Southern states—Texas, Louisiana, Oklahoma, Arkansas, Mississippi, Tennessee, and Alabama.

2. Mid-Continent states — Kansas,



Platformer Still Uses Original Run of Catalyst

Universal Oil Products Co., licensor of the Platformer, believes that this one of Skelly Oil Co. at Longview, Tex., has set a world record for use of catalyst. The unit has been on stream for more than 2 years and has produced 1,000,000 bbl. of 95 octane Platformate on an original run of catalyst. Since the 1,850-bbl. unit went on stream September 5, 1952, it has produced a Platformate having an F-1 octane of 95 with 3 cc. TEL. The catalyst life has exceeded 206 bbl. of reactor charge per pound of catalyst. The cost of the catalyst is now less than 2 cents per barrel charged. During the unit's long run, the Platformate yield has been about 93 per cent. The Reid vapor pressure of the product is 6 lb., and there has been no significant change during the run. The Platformer has been shut down only once, for a routine inspection last spring.

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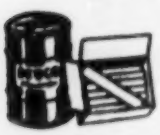

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Sixty-seven per cent of the total capacity of 2,559,800 tons is produced in the Mid-Continent and South. Of the 26 installations being built now, approximately the same percentage is in these areas.

From January 1950 to September of this year, $212,425,000 was invested in ammonia plants. The 26 plants now planned will represent an investment of approximately $280,000,000 when they are completed.

For the period from 1950 to September 1954, $111,000,000 went into plants that were built in the southern states. For the period from September 1954 to the end of 1956, the southern states will get around 47 per cent or $134,800,000.

Foster Wheeler Awarded Contract By Imperial

SARNIA, Ont.—Imperial Oil, Ltd., has started a $25,000,000 program which will completely overhaul and modernize its 18,000-bbl. refinery at Halifax, Nova Scotia.

Foster Wheeler, Ltd., of St. Catharines, Ont., has been awarded the contract for installing a utility plant and processing equipment that will include one of the largest fluid catalytic cracking units in Canada.

The refinery will have a daily capacity of 41,625 bbl. when finished. Among Imperial's nine refineries, it will be surpassed in size only by the refineries at Sarnia and Montreal.

The present refinery will continue to operate until the more modern plant is ready. Present plans call for the construction to be finished in April 1956.

Re-Refining Bids Asked

WASHINGTON.—The Armed Services Petroleum Purchasing Agency has asked for bids (IFB 55-57) on re-refining 1,138,700 gal. of government used oil.

The oil must be re-refined to meet Grade 110 aircraft engine oil under military specification MIL-L-6082A. The oil is located in 18 states and the District of Columbia. The largest single lot, 357,000 gal. is in California.

Bids will be opened here on December 6.

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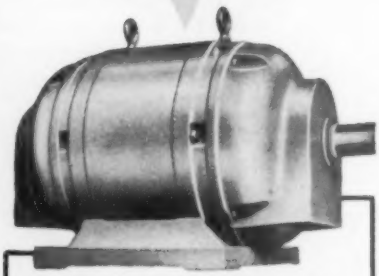

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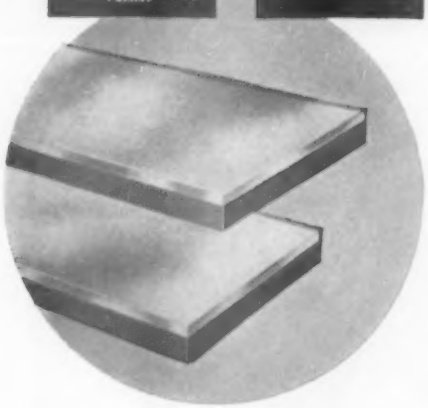

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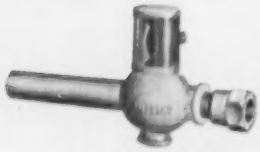

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Among the Drilling Contractors

Acme Drilling Co., Long Beach, Calif., has a rig working on a wildcat location in the Panorama Hills area of San Luis Obispo County, California. The test, being drilled for California Valley Oil Co. at 51-N-28, in 28-31s-21e, is the first in the general area within more than a year. Operators are prepared to drill to around 7,500 ft.

C. F. Martin has contracts for two additional 5,000-ft. wells Robert E. Mead, of Dallas, is starting in the Heidelberg area, of Jasper County, eastern Mississippi. The new wells are the operator's fifth and sixth on his Lightsey lease.

Wilson-Davis, Inc., a newly organized contracting firm, Jackson, Miss., is drilling for John S. Callon, of Natchez, at a wildcat location in northwestern Jefferson County, southwestern Mississippi. Contract is for a 6,000-ft. Wilcox test, at 1 Phillips, in 14-10n-2w.

Two-R Drilling Co. is starting another deep test for Shell Oil Co. in the newly discovered Bayou Sorrel field, 10 miles southwest of Plaquemines, in Iberville Parish, southern Louisiana. The new operation is 1-B Schwing, projected to 11,200 ft. The area's discovery well, 1 Schwing, completed in October, produces gas and condensate from Miocene sand at 10,976-80 ft.

Penrod Drilling Co., Shreveport, is scheduled for a 14,000-ft. test in the Lapeyrouse area, of Terrebonne Parish, Louisiana Gulf Coast. The test, 1 Exposit et al., in 105-20s-18e, will be drilled for Placid Oil Co., an associated operating company.

Carter-Jones Drilling Co., Kilgore, Tex., has a new wildcat operation in Washington County, western Mississippi. It is a contract job for Marine Production Co. at 1 Trotter. Location is 5 miles northeast of Longwood in 35-16n-8w.

Fryer & Hanson Drilling Co., Dallas, has taken a contract for a wildcat test to be drilled for Texas Crude Co. 1½ miles southeast of the new Bolton field, 12 miles west of Jackson, in Hinds County, Mississippi. The test, 1 McAlpin, in 32-6n-2w, will be carried to the Lower Cretaceous horizons found productive at Bolton.

Carnes W. Weaver Drilling Co., Houston, has a rig under contract to Lago Petroleum Co. It is on a wildcat location, 1 Twenty-five Hundred University, Inc., 4 miles west of LaPorte.

Kenneth Condict (top center), tool pusher for Reaves Drilling Co., Cushing, Okla., and his daylight tour crew with C. L. Quick (top left), consulting engineer, Tulsa, on the derrick floor of a recently completed gas-condensate discovery well drilled for Jay M. Shields, independent operator, Los Angeles. The well, 1-A State, located 15 miles southeast of Guthrie, in Logan County, Oklahoma, got production in Misener sand at 4,940-49 ft. Gas flow through ½-in. choke was at the rate of 7,120,000 cu. ft. per day under 950-psi. pressure. Crewmen in the picture are Victor Withrow (top right), driller; and (bottom row, left to right) Norman Shultz, Jack Edgar, Everett Lighty, and Paul Croker, all of Cushing.

east of Houston, in Harris County, Texas Gulf Coast. Location is 2 miles north of Clear Lake field.

Dyer & Smith Drilling Co., Houston, is under contract to Shell Oil Co. for a 14,000-ft. test to be drilled southeast of the old South Houma gas field, in Terrebonne Parish, Coastal Louisiana. The test will be Shell's 5 Peters, in 72-18s-18e.

Penrod Drilling Co., Shreveport, has scheduled a 9,500-ft. test to be drilled for Lamar Hunt trust at a wildcat location 4 miles northeast of Longville field, in southeastern Beauregard Parish, southwestern Louisiana. Location is for 1 Central, in 9-5s-9w.

Baker Well Service Co. is under contract for a 9,000-ft. test to be drilled for Sam J. Recile, of New Orleans, at 1 Hayman-Union Sulphur, on the east side of East Perkins field, in Beauregard Parish, Southwestern Louisiana. Location is in 35-7s-10w.

Chiles Well Servicing Co., Alice, Tex., is contractor on a 3,500-ft. wildcat test A. G. Hill is starting 4½ miles northwest of Hebbronville, in southern Duval County, Southwest Texas. Location is for 1 Benavides, in El Mesquite Survey.

Wise Drilling Account, Tyler, Tex., has the contract for a 6,000-ft. test Watburn Oil Co. is starting in the C. Rucker Survey, 2 miles north of Jarvis, in Anderson County, East Texas. The test is listed as 1 Rice-Woodward-SPLC Unit.

Cardinal Drilling Co. has contracted for another test for Neaves Petroleum Development Co., of Beverly Hills, on the latter's Watson lease in the Wilmington area, 25 miles southwest of Los Angeles. Location, in the city limits, is 1½ miles south of production.

Southeastern Drilling Co., Dallas, is under contract for another deep test in Gulf Oil Corp.'s Anderson Ranch Development area, of Lea County, New Mexico. The new operation, 2 Lea-State "CR," in 2-16s-32, is projected to 13,550 ft.

Garvey Drilling Co., Wichita, Kans., is moving a rig to a rank wildcat location in Greeley County, extreme western Kansas, where it is under contract for a Mississippian test to be drilled for United Carbon Co., Inc. Location is for 1 Wheeler, in 21-17-41. It is 7 miles south of Sidney, and 10 miles from the Colorado line. Nearest Mississippian production is nearly 40 miles to the southeast.

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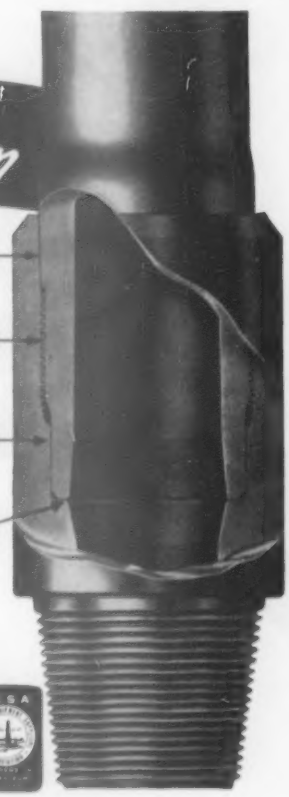
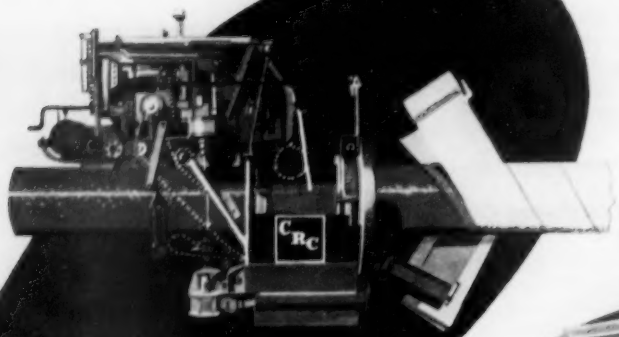
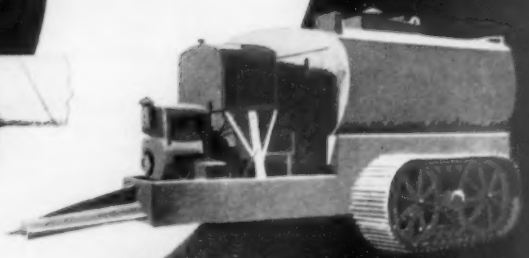




C-R-C TRAVELING TYPE COATING AND WRAPPING MACHINES—COAT AND WRAP 2" THROUGH 36" PIPE LINES



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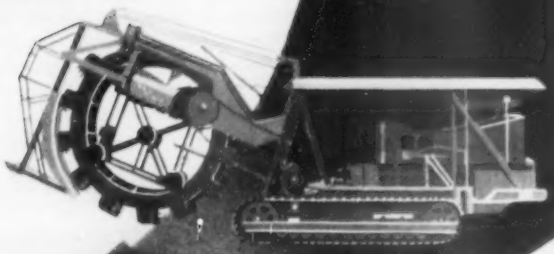
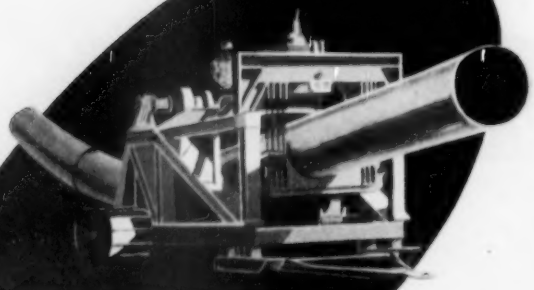


C-R-C DITCHING MACHINES—MIDDLE INCHER AND BIG INCHER—DITCH TO 52" WIDE WITH A DEPTH CUT OF 8 ft.



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Pipeline Patrol

. . . Report on Construction

Ready to Go in the Water

WHEN Western Pipe Line Co. set its recent pipe-laying record *(The Oil and Gas Journal, November 22, page 56)*, on its 625-mile, 20-22-24-in. crude line from Fort Laramie, Wyo., to Freeman, Mo., it used this concrete jacket on its pipe to make underwater crossings. The jacket, applied by Rosson-Richards Co., of Houston, goes on over an ordinary pipe coating. The line, which will carry 178,000 bbl. of crude a day when operating at capacity, even exceeded wartime records established in building the Big and Little Inch lines. Total time for the construction was 61 days after the first dozer began clearing right-of-way.

Under Way, Contracted, and Planned

PIPELINE activity as reported below by The Oil and Gas Journal is compiled from information received from pipeline companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by a • preceding the job.

Crude-Oil Pipelines

Arapahoe Pipe Line Co.—This company owned jointly by Sinclair and Pure has let contracts on a 494-mile crude line from Merino, Colo., to Humboldt, Kans. Completion scheduled for end of year. The contracts were let in the following sections:

Section 1.—146 miles of 18-in. from Merino, Colo., to Colby, Kans. R. H. Fulton Co.

Section 2.—162 miles of 18-in. from Colby to Schurr Station, Kans., R. H. Fulton.

Section 3.—84 miles of 20-in. from Schurr Station to Burns, Kans., R. H. Fulton. Completed.

Section 4.—86 miles of 20-in. from Burns to Humboldt, Panama Williams Co. Completed.

Ar-Mex Pipe Line Co.—Company has applications for two lines before the Office of Defense Mobilization Board for rapid amortization approval.

1. A crude-oil line from Albuquerque, N. M., to Phoenix, Ariz. This line would serve a 20,000-bbl. refinery being planned by Frost & Associates of Dallas.

See Composite and Refinery Catalogs, or Write for Specifications Folder

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Pipeline Patrol

2. A crude-oil line from Guernsey, Wyo., to Albuquerque.

• **California-Oregon Pipe Line System.**—103 miles 6-in., proposed, Crescent City, Calif., to Medford, Ore.

Cheyenne Valley Pipe Line Co.—Company planning a 118-mile, 10-in. crude line from Cheyenne River to Fort Laramie, Wyo. Line will cost $1,838,241 and will connect with the Platte Pipe Line system at Fort Laramie.

Magnolia Petroleum Co.—This company will operate a 48-mile, 12-in. submarine pipeline for itself and Continental Oil Co., and Newmont Oil Co. The line will run to blocks off the coast of St. Mary's Parish, Louisiana, and will have a capacity of 50,000 bbl. per day. Brown & Root, Houston, has the contract and expects to be finished by the middle of 1955.

Minnesota Pipe Line Co.—Williams Brothers Co. has contract to build this 260-mile, 16-in. crude line from Clearbrook to Hastings, Minn. The line, to cost $12,500,000, is the southern end of a system which will move crude from Fosterton field, Sask., to Great Northern's refinery which is building in the Minneapolis-St. Paul area. Present plans call for completion by July 1955.

• **NNCW Pipeline Co.**—127-mile line, proposed, from Weston County, Wyoming, to Casper. 108 miles of 10-in. and 19 miles of 8-in. Est. cost: $3,500,000.

Shell Pipe Line Corp.—Company has awarded Anderson Bros. Corp. a contract to lay 35 miles of 12-in. crude line from Cabin Creek field in Montana to a tank-car loading rack on the Northern Pacific Railroad near Glendive, Mont.

Standard Pipe Line Co.—Company plans to build two crude lines. Applications are now before the Office of Defense Mobilization for rapid amortization approval.

1. A 350-mile, 16-in. crude line from Glendive, Mont., to Guernsey, Wyo., to connect with Platte Pipe Line Co.'s system there.

2. A 330-mile, 16-in. crude line from Wink, Tex., to Albuquerque, N. M. This line would serve a 10,000-bbl. refinery being planned by Frost & Associates of Dallas.

• **Union Oil Co. of California.**—Planning construction of a 60-mile crude line from its Clara Valley field to its Wilmington refinery. Line is expected to be completed by late this year. 12-in. line. Bids being asked.

Products Pipelines

• **American Pipe Line Co.**—Has received ODM approval to amortize 40 per cent of $178,000,000 with a rapid writeoff on proposed line to run from Gulf Coast area to New York City area. Bids for pipe requested.

Badger Pipe Line Co.—Company to build 195 miles of 8-10-12-in. pipeline from East Chicago, Ind., to Madison, Wis. One section of 40 miles has been let to Morrison Construction Co. of Hammond, Ind. 2d section of 32 miles from Lockport to Des Plaines, Ill., let to Contract and Material Co. of Evanston, Ill.

65 miles of 12-in. from Des Plaines to Rockford let to Contracting & Material Co. Evanston, Ill.

56 miles of 12-in. from Rockford to Madison let to Mid States Construction Co. of Mount Vernon, Ill.

• **H. W. Bass & Sons, Inc.**—152 miles, 4-6-in., proposed. Duval and Live Oak counties, Texas, to Corpus Christi, Tex.

Buckeye Pipe Line Co.—This company has awarded 80 miles of 8-in. products line between Lima and Columbus, Ohio, to Sheehan Pipe Line Construction Co. of Tulsa. The line is expected to be in operation by the end of the year.

Cherokee Pipe Line Co.—Company will convert a recently purchased crude line into an aviation and jet fuel carrier from Ponca City, Okla., to Wichita. The company also plans to lay about 8 miles of line to complete the present system into Wichita. Line will serve refineries of Continental Oil Co., and Cities Service Oil Co., joint owners of Cherokee.

Inland Corp.—Company owned jointly by Standard Oil Co. (Ohio) and Shell Oil Co., will construct a 38-mile, 10-in. products line from Toledo to Fostoria, Ohio. Line expected to be in operation by January 1955.

Company also planning 51-mile, 8-in. line from Fostoria to Lima.

• **International Pipe Line, Inc.**—132 miles 8-in., proposed, Wrenshall to Minneapolis, Minn. Cost: $4,200,000.

Malco Pipeline, Inc.—Company planning to build a 91-mile, 6-in. products line from its Prewitt, N. M., refinery to Albuquerque.

Moore Stoner Co.—Company has $2,500,000 tax amortization for a 200-mile, 6-in. products line from a connection with Oil Basin Pipe Line Co.'s terminal at Glendive, Mont., to Minot, N. D.

Shell Pipe Line Corp.—65 miles of 12-in. products line from Baton Rouge, La., to Shell's Norco refinery. Houston Contracting Co. has contract. H. T. Muckley, Supt. Job held up indefinitely by right-of-way difficulties.

Standard Oil Co. of Texas.—Company laying a 248-mile, 6-in. products line from El Paso to Albuquerque. The line will move 5,000-bbl. daily when finished and will cost $4,000,000. Houston Contracting Co. has job.

• **Sunflower Pipe Line System.**—Company proposes to build a 215-mile, 6-in. line to

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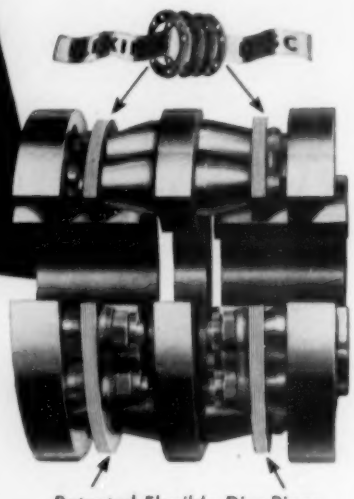

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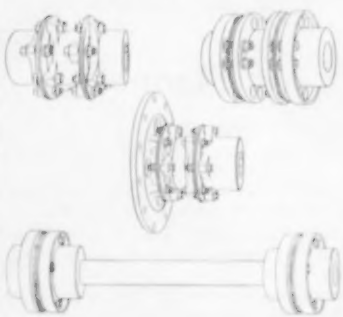

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Pipeline Patrol

transport LPG from six counties in western Kansas to Wichita. Application approved by Kansas Corporation Commission.

Texas Eastern Transmission Corp.—Company has asked FPC permisison to abandon "Little Inch" gas line. If permission is granted, company will spend $71,000,000 converting the line to a products line with a capacity of 235,000-bbl. per day.

U. S. Gov't. Alaskan Products Pipe Line.—600 miles of 8-in. under way from Haines northward through Yukon to Fairbanks, Alaska. Williams Bros., McLaughlin, Inc., and Marwell Construction Co. are doing the work. Pipe laying will be through by November of 1954; however, entire job not expected to be completed until September of 1955.

Natural-Gas Pipelines

• **American-Louisiana Pipe Line Co.**—1,121 miles of 30 and 22-in., 30-in., proposed, extends from North Tepetate, Acadia Parish, Loupisiana, to near Detroit. The 22-in. starts near Payne, Ohio, extends to Bridgman, Mich. Estimated cost: $130,000,000. FPC approved.

• **Arkansas Louisiana Gas Co.**—136 miles of new line proposed, to be added to present system in Arkansas, Louisiana, and Texas. Estimated cost: $9,245,166. FPC approved.

• **Carolina Natural Gas Corp.**—185 miles, 2-12-in., proposed, later lines off Transcontinental in North and South Carolina.

• **Central Hudson Gas & Electric Corp.**—Company has filed application with FPC to construct 48 miles of 12-in. line from Albany to Kingston, N. Y. Line will be started and completed in 1955 if FPC approves.

Chicago District Pipe Line Co.—19 miles of 36 and 30-in., completed of 35 miles planned. Remainder, all 30-in., will be completed in 1954.

• **City of Dalton, Ga.**—Proposes to build 19 miles of 8-in. from a point of interconnection with Southern Natural's Rome-Calhoun transmission line. Estimated cost: $2,940,000.

• **City of Fayette, Ala.**—20 miles, 5-in., F.P.C. approved, Fayette, Ala., to Southern Natural's system in Tuscaloosa County, Alabama. Completion set for early 1955.

• **Colorado Interstate Gas Co.**—365 miles, 22-in., approved by F.P.C., Green River, Wyo., to Denver, Colo., 1954.

• **Colorado-Western Pipe Line Co.**—454 miles of undetermined size pipe planned between Cortez in Montezuma County and Denver. Line would serve towns of Montrose, Gunnison, Salida, Fairplay and South Platte, Colo. Estimated cost: $30,000,000. Company also plans 254 miles of laterals to service Colorado cities not now receiving natural gas.

328-mile line, proposed, to run from a point in La Plata County in southwestern Colorado over the Continental Divide along the eastern slope to serve Pueblo, Colorado Springs, and Denver. Estimated cost: $21,600,000.

• **Fort Worth Basin Gas Co.**—Planned, Novice, through Brown and Comanche counties, Texas.

• **Home Gas Co.**—Work under way on 24 miles of 12-in. from Halsey Valley to Westover, N. Y.

Work under way on 25 miles of 12-in. from Port Dickinson to Deposit, N. Y.

• **Hope Natural Gas Co.**—Proposing to build a 22½-mile extension of existing line from Boone County, West Virginia, to Logan-Mingo County line, West Virginia. Estimated cost: $930,000.

• **Houston Texas Gas & Oil Co.**—Company proposes to build three natural gas lines. One line would run from lower Rio Grande Valley to Chicago. The other line would go from southern Louisiana to New York City. Third line would run from Louisiana to Florida., 20, 24, 30-in., pipe considered in plans. Engineering firm reported preparing an economic report on the lines at present.

• **Iroquois Gas Corp. and Tennessee Gas Transmission Co.**—Companies planning joint storage project to be known as Colden storage field in New York. The following delivery and gathering lines are planned:

17 miles, 16-in. delivery line.

62 miles, 12, 8, 6, and 4-in. gathering lines.

• **Iroquois Gas Corp.**—25 miles of 20-in. line, approved by FPC, from Iroquois' Porterville station near Elma, N. Y., to Tonawanda, N. Y. Est. cost: $1,540,000.

• **Kansas-Nebraska Natural Gas Co., Inc.** Proposes to construct 206 miles of 6-12-in. pipeline to add to present system in central and northeastern Nebraska.

• **Manufacturers Gas Light & Heat Co.**—40 miles, proposed, Allegheny, Washington and Beaver counties, Pennsylvania.

213 miles, 3 to 26-in., proposed, various points on system in Pennsylvania, West Virginia, and Ohio.

72 miles, 16-20-in., Doddridge, Wetzel and Marshall counties, West Virginia. Fulghum Contracting Co. doing work.

• **Michigan Consolidated Gas Co.**—25 miles, 12-in., proposed, from near Sparta to Muskegon, Mich.

• **Michigan Wisconsin Pipe Line Co.**—251 miles, proposed, 24, 18, 12, 6, and 4-in. loops. Majority will be in Wisconsin.

• **Missouri Central Gas Co.**—25 miles, 6-in., proposed, Moberly to Macon, Mo.

• **Missouri Public Service Co.**—136 miles,

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Pipeline Patrol

8-10-in., proposed, New Franklin to Trenton, Mo.

24 miles, 10-in., Johnson County to Clinton, Mo. FPC approved. Est. cost: $600,000.

• **Montana-Dakota Utilities Co.**—Proposes to build 56 miles of 2, 4, and 6-in. line from its 12-in. Cabin Creek-Bismarck line near Gladstone, N. D., to the towns of Lefor, Regent, New England, and Mott, N. D.

• Proposed 34½ miles of 12¾-in. line to run from Baker-Glendive field in Montana to Rapid City, S. D., and 14 miles of 12¾-in. to replace various lines in Park County, Wyoming, and Carbon County, Montana.

Natural Gas Pipe Line Co. of America.—Company has proposed a 280-mile line from Wise County, Texas to Panhandle field in Texas where it would connect with the Peoples Gas & Light Co. line to Chicago.

• **Natural Gas Producer, Inc.**—100 miles, 12-in., planned, Yenter pool to Denver, Colo.

• **New River Gas Co.**—50 miles, planned, Summers to Monroe counties, West Virgina, to Narrows and Dublin, W. Va.

• **North Dakota Gas Transmission Co.**—470-mile line from Tioga plant of Signal Oil & Gas Co., and Beaver Lodge field to Fargo and Grand Forks, N. D. Line will have 78 miles of 12-in., 215 miles of 10-in., 70 miles of 8-in., and 107 miles of 6-in. Estimated cost: $10,800,000.

• **Northern Indiana Fuel & Light Co.**—35 miles, 8-in., planned, Edgerton to Auburn, Ind.

Northern Natural Gas Co.—Company has just recently finished a large summer expansion. Still planned are:

170 miles of 20-24-in. line in Minnesota and Wisconsin running from Duluth to Superior.

400 miles of 24-in. line from the Canadian border to tie in with its system at St. Paul-Minneapolis.

500 miles of 24 or 30-in. planned across North Dakota from Tioga past Minot to Fargo and from there eastward to the Twin Cities.

• **Northwest Alabama Gas District.**—40 miles, 9-in., proposed, Southern Natural's line through Winfield to Haleyville, Ala.

Pacific Gas & Electric Co.—200 miles, 34-in,. planned, paralleling Topock-Milpitas lines. 93 miles completed. 107 miles contracted to Engineers Limited Pipe Line Co. L. E. Robertson is in charge of the spread handling work from Newberry to Danby and from Los Muertos Creek to Gilroy, Calif. Completion November 1954.

15 miles, 20-in., planned for completion in 1955 from Helm Tap to Helm Junction, Calif. Alex Robertson Co.

15 miles, 12-in., planned for completion in 1955. From Herndon to Madera, Calif. Company forces.

• **Pacific Northwest Pipeline Corp.**—1,466 miles, proposed, Ignacio, Colo., to Bellingham, Wash. Approved by FPC.

380 miles, proposed, laterals and spurs off main line to Pocatello, Idaho, to Yakima, Wash.

• **Pine Tree Natural Gas Co.**—204 miles of undetermined size pipe to run from the Boston area to Bangor, Me.

• **Shenandoah Gas Co.**—40 miles, 3-4-8-in., proposed, Middleton, Va., to Martinsburg, W. Va. Est. cost: $1,470,000. FPC approved.

• **South Georgia Natural Gas Co.**—368 miles, 2-12-in., planned, Phoenix, Alta., to Tallahassee, Fla. (a) 12-in., Phoenix, Ala., to Albany, Ga., (b) 10-in., Albany, Ga., to Moultrie, Ga., (c) 8-in., Moultrie, Ga., to Tallahassee. Est. cost: $9,000,000. FPC approved.

• **Southwest Alabama Gas District.**—150 miles, 10 and 8-in., planned, Phoenix City to Dothan, Ala. Engineering Const. Co.

Tennessee Gas Transmission Co.—243 miles 24-in., planned, Coudersport, Pa., eastward across Pennsylvania, New Jersey, and New York to point near Greenwich, Conn.

• **Texas Eastern Transmission Corp.**—Proposed, 382-mile, 24-in. line from Kosciusko, Miss. to Beaumont, to connect with the existing 30-in. line there to Connellsville and replace the "Little Inch" in moving natural gas.

• Company proposes to build 58 miles of 20 and 16-in. pipeline from Joaquin to Longview, Tex. Cost: $3,269,000. FPC approved.

• **Transcontinental Gas Pipe Line Corp.**—421 miles, 30-36-in., looping along Texas-New York line.

• 19 miles of 12.75-in. pipe starting at West White Lake field in Vermilion Parish, Louisiana, and connecting with applicant's transmission line in same parish. Estimated cost: $1,042,310. FPC approval received.

• 57 miles of 36 and 30-in. paralleling sections of its existing system in Louisiana, Mississippi, and Alabama. Approved by FPC. Est. cost: $6,533,000.

• 25 miles of 12-in. in Cameron and Calcasieu parishes, Louisiana, to additional gas reserves. Est. cost: $1,000,000.

• **Trunkline Gas Co.**—Proposes to cross the Mississippi River with two 24-in. lines near Greenville, Miss. Est. cost: $2,960,000.

• **Utah Natural Gas Co.**—Planning 40 miles from Orem to Salt Lake City, 16-in. pipe at later date. Contract not let yet.

Virginia Natural Gas Co.—153 miles, Buckingham to Richmond and Portsmouth, Va.

Foreign Crude-Oil Pipelines

• **Atlas-Dresser.**—Included in this company's agreement with the Argentine Govern

for Compressed Air and Gas Drainage

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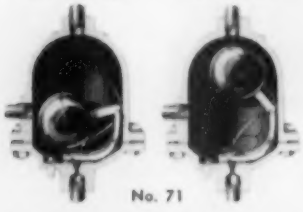
No. 71-315 forged steel Armstrong "Snap-action" Traps draining water from natural gas scrubber.

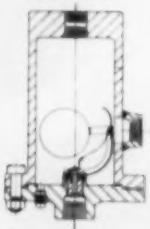
TRAP CLOSED TRAP OPEN



No. 71

Spring holds valve tight until float buoyancy overcomes spring pressure. Then spring snaps up, opening valve wide. Before all water leaves trap, valve snaps closed.

FORGED STEEL No. 71-315



For pressures to 1000 lbs. Same mechanism as No. 71.

Positive action, no dribbling, no hunting, no gas or air loss—these are the advantages of the Armstrong "Snap-action" ball float trap with spring-powered valve. The valve is always water-sealed. Fine dirt and grit won't interfere with operation.

Don't worry about maintenance. The flat strip spring of special Swedish steel lasts for years in ordinary service. Valve and seat are hardened chrome steel. All other internal parts are stainless steel. Special materials are available for special corrosion problems.

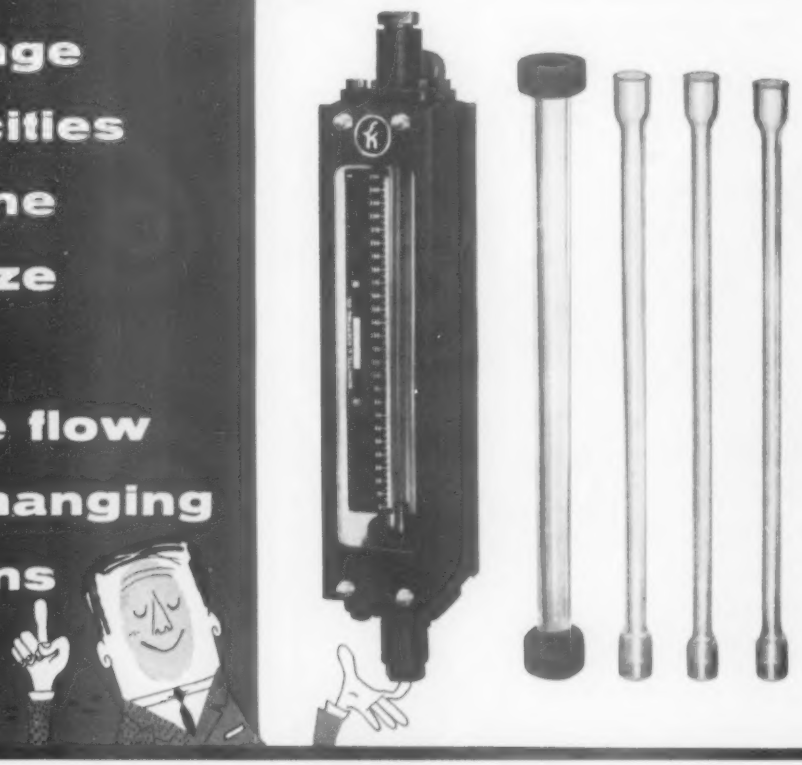
Like all Armstrong products, these traps are *unconditionally guaranteed* to satisfy. Call your local Armstrong Representative, or write Armstrong Machine Works, 868 Maple St., Three Rivers, Mich.

NEW! How to Select TRAPS

Free Bulletin 289 gives complete selection data on ball float traps for draining water and light liquids. Ask for your copy. No obligation.

This versatile **ROTAMETER** gives

wide range of capacities within one meter size lets you measure flow under changing conditions



Ever wish for a *versatile* meter? One that adapts *in minutes* to changing rates of flow? You get your wish *with the SK Safeguard Rotameter because . . .*

. . . *Four Sizes of Tubes,* each offering a different capacity, can be used in a single Rotameter.

. . . *Tubes Interchange Quickly*—can be removed and replaced to meet changing conditions.

. . . *Exclusive Belled Ends* of tubes, all having same inlet and outlet OD, permit standardization of end fittings and packings. No special tools or fittings needed.

. . . *Numerous Rotor Designs* can be used within one meter tube to provide wide range of capacities.

Where flow rates change frequently, as in proportioning dissimilar fluids, you'll find the *SK Safeguard Rotameter* outstandingly convenient and economical. Accurate, durable and safe, too, because . . .

. . . Meter Case of Strong, Rigid Steel completely encloses tube—protecting against external shock, acting as a safeguard should tube break accidentally.

. . . Heavy Gauge, Safety Glass Windows provide excellent view of tube, rotor and scale.

. . . Detachable Metal Reference Scale is clearly marked for easy reading—can be supplied in units of flow, or in millimeters for use with calibration charts.

. . . Bronze, Cast Iron or Stainless End Fittings are designed to permit connection to piping in any of four horizontal positions.

. . . Non-leaking, Seated, Clean Out Plugs at top and bottom of end fitting permit rotor removal and tube cleaning without disassembly.

. . . Packing Glands are adjustable from outside of case by means of stainless steel capscrews.

Get Your Free Copy of Bulletin 18-RG. It details operating principles, sizes and dimensions, construction features of SK's Safeguard Rotameter. Yours without obligation.

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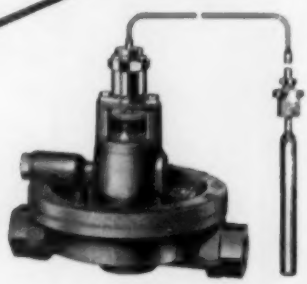

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Regulates temperature precisely

Maintains accuracy
despite climatic changes

Operates indefinitely
despite sour gases, wind, sand

. . . tested under all conditions this new single unit, mercury actuated system stops oil loss . . . eliminates failures common to oil industry controls of the past.

Write for Complete Facts and Specifications

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the pioneer in mercury thermal controls

Offices in All Principal Cities

THE PARTLOW CORP., NEW HARTFORD, N. Y.

AN OLDTIME RECIPE FOR LONG-LIVED PIPE LINES

A recipe that waterworks and gas distribution engineers have used for over a century is: *specify cast iron pipe.* Refinery engineers have used it, too—with good success—for run-down, water and gasoline lines—for fire protection systems—salt water disposal—condenser and cooling coils.

No other pipe, at reasonable first cost, offers comparable resistance to both interior and exterior corrosion. No other pipe, in its price range, is as economical in the end. Available with bell-and-spigot, plain end and flanged, or with standardized mechanical joints. Cast Iron Pipe Research Association, Thomas F. Wolfe, Engineer, 1015 Peoples Gas Bldg., Chicago 3, Illinois.

CAST IRON PIPE

FOR LONG LIFE AND ECONOMY

For Your Protection . . .

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The service behind TAPECOAT is as distinctive as this coal tar coating in tape form. The sales engineer who sells the job also services it personally. That's why you can specify TAPECOAT with confidence and know that you are getting lasting protection for pipe, pipe joints, tanks and other vulnerable steel surfaces above or below ground. Sizes: Rolls of 2", 3", 4", 6", 18" and 24" widths. Easy to apply. Dependable since 1941 in cutting maintenance and replacement costs. Write for details and prices.

The TAPECOAT Company

Originators of Coal Tar Tape Protection

1539 Lyons Street, Evanston, Illinois

No. 212 Blowout Preventer

—provides maximum safety and convenience in operation. It is comparatively light in weight yet has a 3000 pound capacity. It is an ideal tool for swabbing or running rods in wells that head or flow in the course of operation. Made in 2", 2½" and 3" sizes, the Ratigan #212 Blowout Preventer is

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J. P. RATIGAN, Inc.

1213 Santa Fe Ave., Los Angeles 21

Export: National Supply Co., Inc., Export Div. 600 Fifth Ave., New York 20, N. Y.

Pipeline Patrol

ment are plans to built a 400-mile, 16-in. crude line from Plaza Huincul area to Bahia Blanca.

Bombay Port Trust.—50 miles, 8 to 24-in., contracted, Bombay, India, to serve Standard Vacuum Oil Co., and Burmah Shell refineries. Merritt, Chapman & Scott Corp., contractors. (Crude and Products). Collins Const. Co. has subbed 84,000 ft. of Subaqueous work. Shutdown for Monsoon season during summer. Work resumed September 15.

Interprovincial Pipe Line Co. and Lakehead Pipe Line Co.—Contracts have been awarded for 604 miles of looping; 454 miles will be in Canada, the remaining 150 miles will be in the United States.

201 miles of 24-in. between Regina and Gretna, Man., have been awarded to Anderson International Contractors, Ltd., of Edmonton, Alta.

Mannix, Ltd., of Calgary, Alta., will lay 129 miles of 24-in. line between Edmonton and the Alberta-Saskatchewan boundary.

Fulton-Bannister, Ltd., has contract for 125 miles of 24-in. line to connect the lines being built by Anderson and Mannix.

R. H. Fulton & Co., of Lubbock, Tex., has the contract for 104 miles of 26-in. looping from the Canadian border southeast. Anderson Bros. Corp. has contract for 50 miles of 26-in.

• **Petroleos Mexicanos.**—145 miles, 12-in., considered, 18 de Marzo field via Reynosa to Monterrey, Mexico.

100 miles, planned, Isthmus of Tehuantepec, Jose Colomo to El Plan field, Minatitlan.

72 miles, 12-in., proposed, Poza Rica to Atzacapotzalco, Mexico.

South Saskatchewan Pipe Lines, Ltd.—Fulton-Banister, Ltd. has contract to construct 150 miles of 16-in. crude line from Fosterton field in Saskatchewan to a connection with Interprovincial Pipe Line Co.'s system at Regina. Line will have a capacity of 20,000-bbl. per day, will cost $10,000,000 and is expected to be finished in November.

Texas Petroleum Co.—Contract has been let to Foster Wheeler Corp. and Panama-Williams for a 119-mile 12-in. crude line to move oil from Velasquez field in Colombia to a connection with the main Andian National system at Galan. Est. cost: $6,000,000.

• **Yacimientos Petroliferos Fiscales Bolivianos.**—170 miles, 4-in., planned, Bermejo to Tupiza, Bolivia.

Yacimientos Petroliferos Fiscales Bolivianos.—Bolivian Government oil organization has awarded contract to Williams Brothers, Sudamericana, Ltd., to construct a 6-in. crude line from Camiri field to Yacuiba on the Argentine border. The project will cost approximately $2,500,000.

Foreign Products Pipelines

Anglo-Iranian Oil Co., Ltd.—18½ miles 16-in., under way, Little Aden to Aden. Bechtel Corp. Completion date December 1954.

18½ miles, 6-in., under way, Little Aden to Aden,. Bechtel Corp. Completion date December 1954.

15 miles, 12-in., under way, Kwinana to Fremantle, M. W. Kellogg Co. Completion date February 1955.

17 miles, 6-in., Kwinana to Fremantle. M. W. Kellogg Co. Completion date February 1955.

Australasian Petroleum Refinery, Ltd.—Company plans two lines from the new Kwinana refinery in western Australia to the port of Fremantle to be completed early in 1955. One line will be 15 miles of 12-in. The other line will be a 17-mile, 6-in. line.

• **Empresa Nacional del Petroleo** — 80

Effortless way to reduce Pumping Costs!

Specify DARCOVA

valve cups, seating cups and rings

The Original composition valve cup ... still the best!

• Precise control of all materials and processes from lab to well means exceptional resistance to wear and deterioration . . . fewer pulling jobs! • Different textures, scientifically developed, fully proved, give peak efficiency and longer flex-life at *any* depth! • Accurately controlled sizes for any make or size pump . . . no misfit inefficiency! • Ask for *genuine* Darcovas at your supply store.

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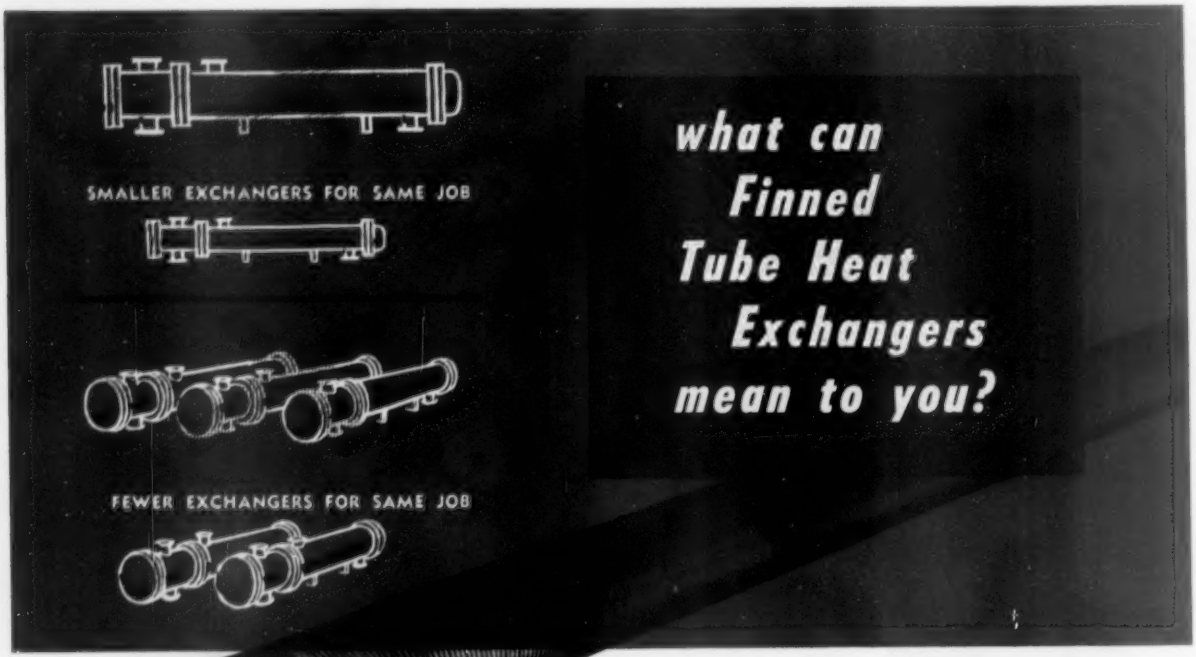
THE ORIGINAL COMPOSITION CUP

"THE BRAND OF PROGRESS"

By Heat Exchanger Specialists

▲SYNOPSIS OF AD #9: In its design and manufacture of all types of heat exchangers, Western Supply exerts rigid quality control over raw materials, machining, assembly, and testing. Typical of these procedures is periodic X-Ray of the work of the entire welding crew to assure consistent weld quality. This procedure is, of course, over and above the regular weld X-Ray of critical fabrication points as required by the various construction codes.

tenth in a new series of advertisements



Western's Experience in FINNED TUBE Heat Exchangers Again Demonstrates Progress Toward Economy Design

Within recent years rising material and labor expenses have greatly increased the cost of heat exchangers. For this reason, Western Supply's pioneering and experience in low-finned tube construction constitutes one of the company's most impressive stories in customer service.

Finned tube construction has the one big advantage of giving approximately 2½ times the heat transfer surface on the tube. For a great many applications this can mean either smaller exchangers or fewer exchangers - - - with resultant economies to the customer.

Western engineers, believing in the ultimate success of finned tube design, proceeded with research and experiments eventually leading to a considerable amount of finned tube fabrication. Now that finned shell-and-tube units are receiving wide-spread acceptance, Western holds an advantage in having left the testing stage behind.

The above is but one example of Western's operational versatility. In the realm of thermal and mechanical design, the company builds equipment for temperatures as low as minus 100°F. . . as high as 1600°F - - - for pressures as high as 4,000 psi . . . as low as 65 millimeters mercury absolute. These figures are not limiting and Western stands ready to tackle any thermal or mechanical problem.

WESTERN
HEAT EXCHANGERS
WESTERN SUPPLY CO.
P. O. BOX 1888 • TULSA, OKLAHOMA

Pipeline Patrol

miles, 6⅝-in., planned, Concon to Santiago, Chile.

• **Governments of Southern Rhodesia and Portuguese East Africa.**—200 miles, considered, Beria, Portuguese Mozambique to Umtalia, Southern Rhodesia.

North Atlantic Treaty Organization (NATO).—1,920 miles, 4-10-in., to serve military bases in Western Europe (to connect with U. S. Government's St. Nazaire-Paris-Metz line). Contracted by Soc. Foster Wheeler Francaise.

Overland Pipeline Corp.—This South African firm has requested government permission to build a 350-mile line, to cost $8,450,000, from the South African coast to Rand, a plateau area in southern Transvaal where there is heavy petroleum consumption.

• **Petroleos Mexicanos.**—124 miles, 6-in., planned, Lagos to Guadalajara, Mexico.

54 miles, 6-in., planned, Lagos to Aguascalientes, Mexico.

82 miles, 8-in., planned, Salamanca to Lagos, Mexico.

• **United States Government.**—375 miles, 12-in., planned, St. Nazaire to Melun and Metz, France.

• **United States Navy Department.**—Proposed 300-500-mile line to be built in Spain to serve a proposed naval base and four large air bases which are also proposed under a defense agreement with the Spanish Government. No definite size or cost is known now.

Winnipeg & Central Gas Co.—Canadian company plans to build a $20 million butane-propane system. Company plans to get gas L.P.G. from Signal Oil & Gas Co.'s Tioga, N. D. plant and move it to Winnipeg. Size and route of the line has not been definitely established.

Foreign Natural-Gas Pipelines

Alberta Gas Trunk Line, Ltd.—This Canadian firm has let engineering contracts to two firms, Dutton, Williams Brothers, Ltd., and Mannix, Ltd. for a 300-mile, big inch gas-gathering system to collect Alberta's natural gas for transportation to Trans Canada Pipe Line Co.

Attock Oil Co.—Company plans to build 60-mile natural gas pipeline from Dhulian field to Rawalpindi in West Pakistan.

Azienda Generale Italiana Petroli—90 miles, 12-in., under way, Cortemaggiore to Bologna, Italy, SNAM crews.

120 miles, 16-in., under way, Cremona Porto Mar to Ghera, Italy, Montubi, contractor.

40 miles, 12-in., under way, Ripalta-Bergamo, Italy.

• **Empresa Nacional del Petroleo**—80 miles, 10-in., planned, Concon to Santiago, Chile.

Petroleos Mexicanos.—205 miles, 16-in., under way, Monterrey to Torreon, Mexico.

• **Petroleos Mexicanos.**—440 miles, 20-in., planned, Brazil to Tampico to Poza Rica, Mexico.

Winnipeg & Central Gas Co.—Company has plans for a $20,000,000 propane-pipeline network. Line will extend from Alberta gas fields to Winnipeg and from Winnipeg to Tioga, N. D. Plans are still incomplete.

Sui Gas Transmission Co., Ltd.—Morrison-Knudsen Construction Co. has contract to build 350-mile, 16-in. line from Sui field to Karachi in West Pakistan. Est. cost: $25,000,000.

• **Trans-Canada Pipe Lines, Ltd., Canadian Delhi Oil Co.)**—2,247 miles, 14 to 30-in. proposed, Alberta to Toronto to Montreal.

747 miles, 8 to 24-in., gathering system in Alberta.

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The Oil and Gas Journal
Box 1260 Tulsa, Okla.

Joint by Joint . . . the "B-36"

. . . MOVES AHEAD

• Another 40′ joint of Transcontinental Gas Pipe Line Corporation's 36″ gas line is lowered in and welded. As welds were completed, joint sleeves were applied and doped. Pipe was never moved after welds were completed.

Hydrostatic tests of the line failed to show any leaks in pipe or welds, proving another advantage of the "sewer-pipe" method for laying giant pipe lines.

It pays to associate with . . .

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Earl Allen, President — *Sam A. Taylor, Vice President*
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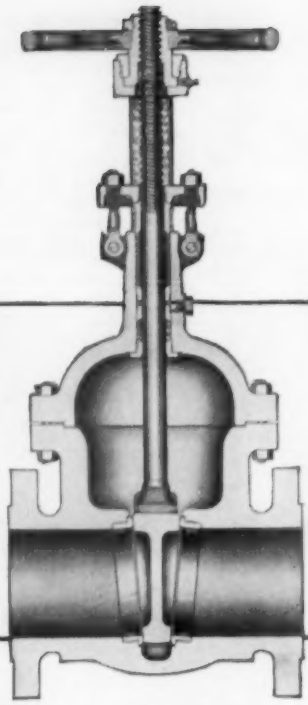
let valves of
known dependability
keep your piping costs
in line

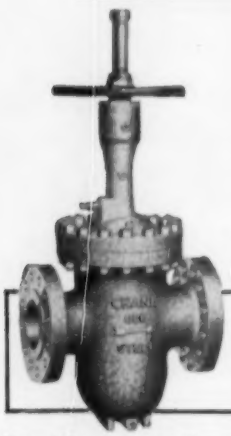
CRANE

Here are some of the most famous valves in pipeline service—famous for their greater suitability, dependability, and long-range economy. The consistent success of Crane pipeline valves is easy to understand when you consider the background . . . dating clear back to the early days of the petroleum industry.



CRANE CAST STEEL WEDGE GATES

The pioneer steel valve that has never been topped in quality and performance. A stronger and more rugged valve because of Crane skill in steel casting. Dependable wedge gate design with solid wedge-type disc. Long, close-fitting guides assure accurate seating—minimize wear. Crane *Exelloy* trim on all seating surfaces provides the resistance you want against erosion and wear. Deep, lantern-type stuffing box assures tightness and long packing life. Crane Cast Steel Wedge Gates are available in a wide range of sizes with flanged and welding ends; 150, 300, and 600 lb. class.

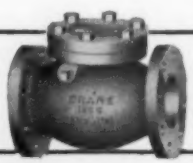


CRANE CONDUIT-TYPE GATES CLASS 600

Even infrequent operation won't affect their efficiency, for all working parts are sealed in grease. Dual-seating double disc is fully seated in open as well as closed position, thereby solving erosion problems. Conduit-type disc ports coincide exactly with seat openings for smooth, clear flow with minimum pressure drop. Full-Way or Venturi patterns for working pressures up to 1440 pounds, oil or gas. Sizes 2 to 30 inch.

CRANE IRON BODY WEDGE GATES

You see plenty of these dependable 125-pound Crane valves along the nation's pipelines. Adaptable for all types of services, they feature an exceptionally strong oval-shaped body and bonnet. Available with either double disc or solid wedge disc. OS&Y and non-rising stem patterns, brass trimmed or all-iron. Screwed or flanged end valves available. Complete range of sizes.



CRANE IRON BODY SWING CHECKS

Well-proportioned, sturdy valves, globular in shape to provide ample flow. *The disc cannot stick in open position.* All-iron or brass trimmed, whichever your service demands. All-iron valves have seating surfaces cast integral with body and disc. Seat ring in brass-trimmed valves is screwed into the body. All sizes have the hinge suspended in the body, permitting simplified change-over to outside lever and weight. Sizes up to 24 inch.

THE BETTER QUALITY . . . BIGGER VALUE LINE . . . IN BRASS, IRON, STEEL

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

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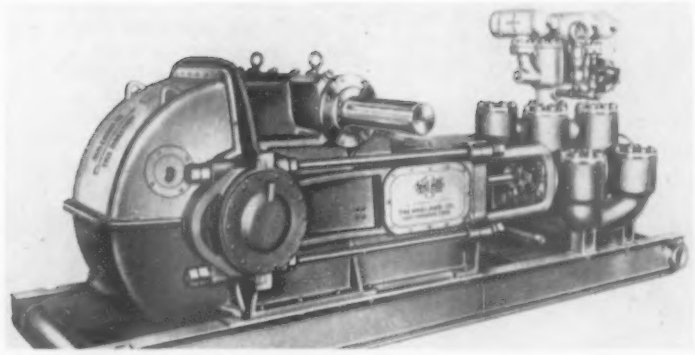
. . . What's New in Equipment?

Use the handy Time-Saver Cards ✔✔✔ to obtain additional information on these items

by Dan B. Miller



Big Slush Pump Features Low Weight

The new 750-hp. 7¾ by 18-in. duplex-power slush pump HP-18000 features compact design, low weight, and extra power.

The pump was designed for profitable use on medium as well as deep wells. It is light enough to be moved in one piece as a complete unit and strong enough for the toughest jobs. The pump has low center of gravity, over-all dimensions within load limits, and base construction to permit easy loading and skidding.

The new pump is built to deliver sufficient volume and pressure to drill from the surface down to 20,000 ft. without needing another pump connected in parallel or compounded. It delivers volume and pressure that permit the use of any type of jet, conventional or core bit in any formation.

The HP-18000 pump has been field tested. On its first 12,500-ft. well it was not necessary to remove a pot cover. Up-to-date field records will be submitted. *Wheland Co.*

Check No. 1 On The Time-Saver Card

●

Weldanpower Is Combined Welder And Power Source

A new combination welder and auxiliary or standby power unit for maintenance work features low cost, large capacity, and simultaneous output of both welding and auxiliary current. The Weldanpower is rated as a 200-amp. welder and a 4-kva., continuous-duty power unit. For intermittent standby power, it is rated at 5 kva.

For industrial use the machine supplies a wide range of a.c. current for maintenance welding to repair equipment breakdowns, repair worn parts, hardface machine parts, make replacement parts, build special equipment, or fabricate piping. The machine also supplies 230/115-volt, 60-cycle single-phase a.c. standby power to operate power tools, pumps, and lights.

The Weldanpower is an a.c. alternator powered by a 12-hp. air-cooled gasoline engine. Rigidly coupled to the engine shaft is a four-pole, laminated-steel rotor on which coils are wound. The stator has two separate windings, one for the welding circuit and one for the power supply so that both power sources are available simultaneously.

Accurate voltage control of output insures efficient operation of electrical equipment. Normal voltages are held constant regardless of load variations. This prevents both overvoltage and undervoltage. To produce this near flat or constant-voltage regulation from no load to full load, the separate field exciter has two compound windings and a third series field winding.

For welding, the operating panel provides taps which supply a.c. current for use with electrodes ranging from 5/64 to 3/16-in. diameter. In addition to the tap range of output, a heat control is used to raise or lower the current from any one tap to suit exact requirements of the welding job. A continuous current range from 20 to 200 amp. is provided for welding, hardfacing, brazing, heating, and soldering. *The Lincoln Electric Co.*

Check No. 2 On The Time-Saver Card

●

New Device Measures And Transmits Temperatures

A new instrument accurately measures process temperatures and pneumatically transmits the information to a central recording or controlling station. Known as Model 12A temperature transmitter, it is a nonindicating device of the force-balance type with a calibrated accuracy of ½ per cent of the temperature span and compen-

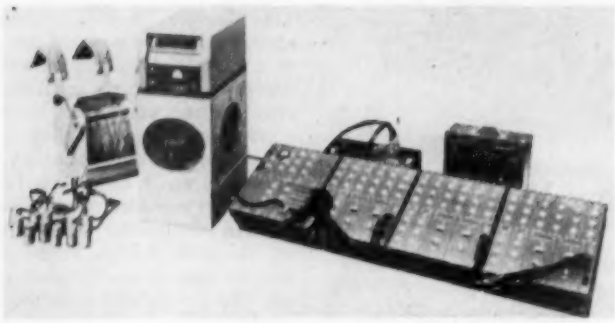
sated for ambient temperature and barometric pressure variations.

Of rugged construction and simple in operation, the new transmitter is designed around a gas-filled thermal system which exerts force on a flapper nozzle mechanism in proportion to the measured temperature. The resulting back pressure in the nozzle circuit, amplified through a relay and converted to a force through a bellows, quickly balances out the initial force and constitutes the 3 to 15 psi. output transmitted by low-cost tubing to the receiving instrument.

Spans ranging from 50° to 400° F. are available and can be utilized between the limits of —100° and +1,000° F. Three and a half feet of protected capillary tubing connects temperature bulb to transmitter. A block-and-clamp mounting arrangement rigidly secures the 7-lb. instrument to any vertical or horizontal pipe or to a flat surface. The instrument is completely weatherproof, permitting installation in hazardous or corrosive outdoor areas. *Foxboro Co.*

Check No. 3 On The Time-Saver Card

●



Seismic System Has Wide Dynamic Range

A complete new seismic system with wide dynamic range, called Model 7000 seismic amplifier system, is a high-gain, low-distortion system specifically designed for magnetic recording as well as for conventional seismic applications.

The system incorporates three automatic gain-control speeds with a 1,000,000:1 range. In addition to automatic gain-control operation, it also may be operated on constant gain or time-varied gain. Total system gain is over 120 decibels, with input range from 0.1 mv. to 0.1 volt between 10 and 200 cycles. Great flexibility in filtering is provided by an unusually large number of useful filter settings, totaling 1,380.

The 7000 system is a truly portable field intsrument because of lightweight construction. Desirable features formerly found only in truck-mounted amplifiers have been incorporated into the 7000 system.

Modular design and lightweight construction limit maximum weight of any one element to 57 lb. with the 50-trace recording oscillograph weighing only 41 lb. Aluminum and magnesium are used extensively and components are equipped with carrying handles or optional back-pack adapters. *Houston Technical Laboratories.*

Check No. 4 On The Time-Saver Card

●

Portable X-Ray Unit Can Give 360° Radiation Sweep

A new type of portable industrial X-ray unit is capable of producing a 360° radiation sweep, which enables radiographers to attain new highs in inspection efficiency, and greatly reduce the cost of inspection.

Many products can be set up in a circle around the business head of the machine and all can be X-rayed with a single exposure. This can reduce radiographic operation time in some industries by as much as 97 per cent. If desired, the unit can also operate as a conventional type with a limited angle cone of radiation.

The unit can be placed inside a pipe or pressure vessel and used to take inside-out X-ray views. The advantage of this technique is that it confines the radiation within an enclosed area and thus increases protection to personnel against radiation exposure, and also that it permits the making of a complete circumferential weld radiograph with a single exposure.

Known by the model No. OX-175, the new machine consists of a tank to house the X-ray tube, (and energizing transformers) linked to control and power source by interconnecting cables. The tube head weighs less than 185 lb., has a diameter of 10½ in., and a length of 42 in. The small control, measuring only 18 by 18 by 14 in., weighs 145 lb.

The OX-175 can be mounted and used in field, shop, and laboratory in many different ways: on a mobile truck with elevating tube stand, rotating tube stand, or tube carrier; on a bridge crane; installed inside a radiographic cabinet; on a mobile base; or on a fixed mounting with an elevating tube stand. *General Electric Co.*

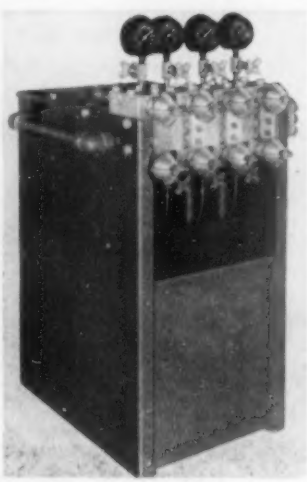
Check No. 5 On The Time-Saver Card

●

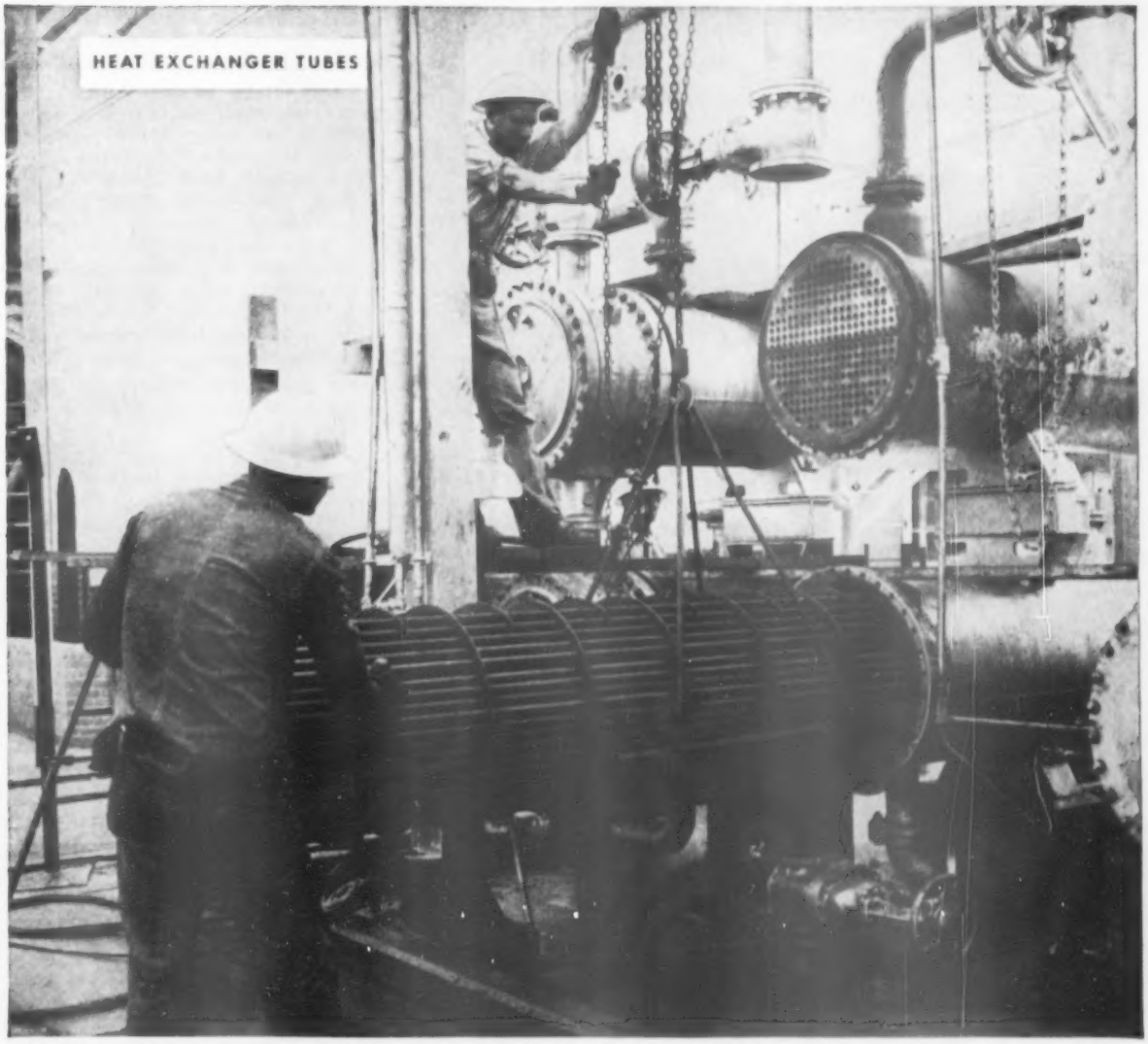
Control Station Designed For Hydraulic Well Pumping

A fully packaged control station is engineered specifically for hydraulic oil-well-pumping installations to simplify the starting, shutting in, controlling speeds, maintaining manifold pressure, metering of individual wells, and running of soluble plugs.

Regulation of fluid input to individual pumps is obtained with adjustable flow-control valves. Separate shut-off and flow-control valves are utilized



to divert input flow through a meter positioned in the control-unit cabinet. Soluble plugs are inserted into the lines through built-in plug injectors.



PERFORMANCE RECORD of these tubes under actual operating conditions is now a part of Anaconda's extensive collection of case histories.

Use of Anaconda Cupro Nickel, 10%-755 Tubes in Texas refinery may answer your tube problem

Imagine a collection of tube performance case histories that can answer many of the corrosion problems you face!

Our files bulge with such a collection. Here is experience accumulated over almost a century. Here are detailed records of tube performance under hundreds of actual operating conditions.

We can put the information in these files to work for you at once—to help you select the one best alloy for your job.

Here's a case history we are now adding—the use of ANACONDA Cupro Nickel, 10%-755* Tubes in the Port Neches Refinery of a major oil producer.

These tubes—in use two years—cool heavy gas oil in an Alco Exchanger on a Crude Pipe Still Unit. Gas oil at about 500°F.—mildly corrosive—comes in contact with the outside of these tubes. Brackish river water—with a high salt content—circulates through the tubes. Yet the tubes show no sign of corrosion.

CUPRO NICKEL, 10%-755 resists corrosion almost as well as Cupro Nickel, 30%-702; yet it costs much less. Polluted sea water and sea water with entrained air—even at relatively high velocity—have little effect on this alloy.

Help for your tube problem. No one tube alloy serves best under all conditions. Your problem is one of choosing the right alloy for the job. Let Anaconda's Technical Department help you. Write, outlining your operating conditions, to Dept. TD, *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.*

*U.S. Patent No. 2,074,604 54109

ANACONDA®
Tubes and Plates
for Condensers and Heat Exchangers

Stroke of Genius

◆ No question but what these men are playing it smart.

They're running a Precision Pump—mostly because they know they can get a long, even stroke without any flexing or binding. That's possible because Precision Pumps are built to exacting standards, with special attention to items like the fit and alignment of critical working parts.

The barrel tubes are tough, non-galling seamless steel, machine-straightened and finished to a perfect inside working surface. The plunger consists of several 12" sections, perfectly aligned on a seamless steel mandrel tube. Chrome-plated or hardened-steel plungers and barrel tubes, heavy-duty pumps with double-thick wall barrel tubes, and stroke-through pumps can be furnished for various well conditions.

The next time you run a pump, do like these men did. You'll be glad you did, because you'll be pleased with the long, trouble-free service you'll get.

"Best Pumps in the Oil Patch"

Your store or one of our factory representatives will be glad to give you more information without obligation ●

H-F Precision ROD PUMP

Harbison-Fischer Mfg. Co. ▪ Fort Worth

The unit affords flexibility as the initial unit need consist of components for only two or more wells. Individual well sections can be added as needed by bolting on.

O-ring seals replace numerous screw connections to assure leak-free operations and reduce maintenance expense. Unrestricted fluid passageways and short fluid travel reduce frictional losses to a minimum.

Rigid construction practically eliminates vibration problems and a station controlling a dozen wells takes up only 30 by 60-in. space. The equipment is constructed to handle pressures and capacities encountered in hydraulic pumping systems and each unit is tested to 5,000 psi. prior to shipment. *Well Controls, Inc.*

Check No. 6 On The Time-Saver Card

●

Six-Roller Pipe Cutter Eliminates Spiraling

A new heavy-duty six-roller pipe cutter is specially designed to prevent spiraling when used with power drives. Capacity range is ⅛ to 2-in. pipe.

The design makes it easy for the mechanic to see the cutoff mark. Rollers in hook provide true alignment, assuring square cutoff. The unit tracks perfectly and the sturdy malleable frame is formed to fit the hand and is guaranteed warpproof. High-alloy steel-cutter wheels leave practically no burr. The single cutter wheel is in the sliding block. *Toledo Pipe Treading Machine Co.*

Check No. 7 On The Time-Saver Card

●

Kontol Inhibitor Cuts Out Duplicate Injection Pumps

Kontol 149, an organic-corrosion inhibitor, is injected at very low concentrations into the overhead vapor-condensing sections, usually along with alkaline agents such as ammonia or caustic. The purpose of the inhibitors is to prevent the corrosion of internal metal equipment caused by hydrogen sulfide, hydrochloric acid, carbon dioxide, and other acidic ingredients.

SEVERAL THOUSAND DOLLARS SAVED ON THIS LOCATION BY USING THE–

Carter

long-stroke Hydraulic Pumping Units

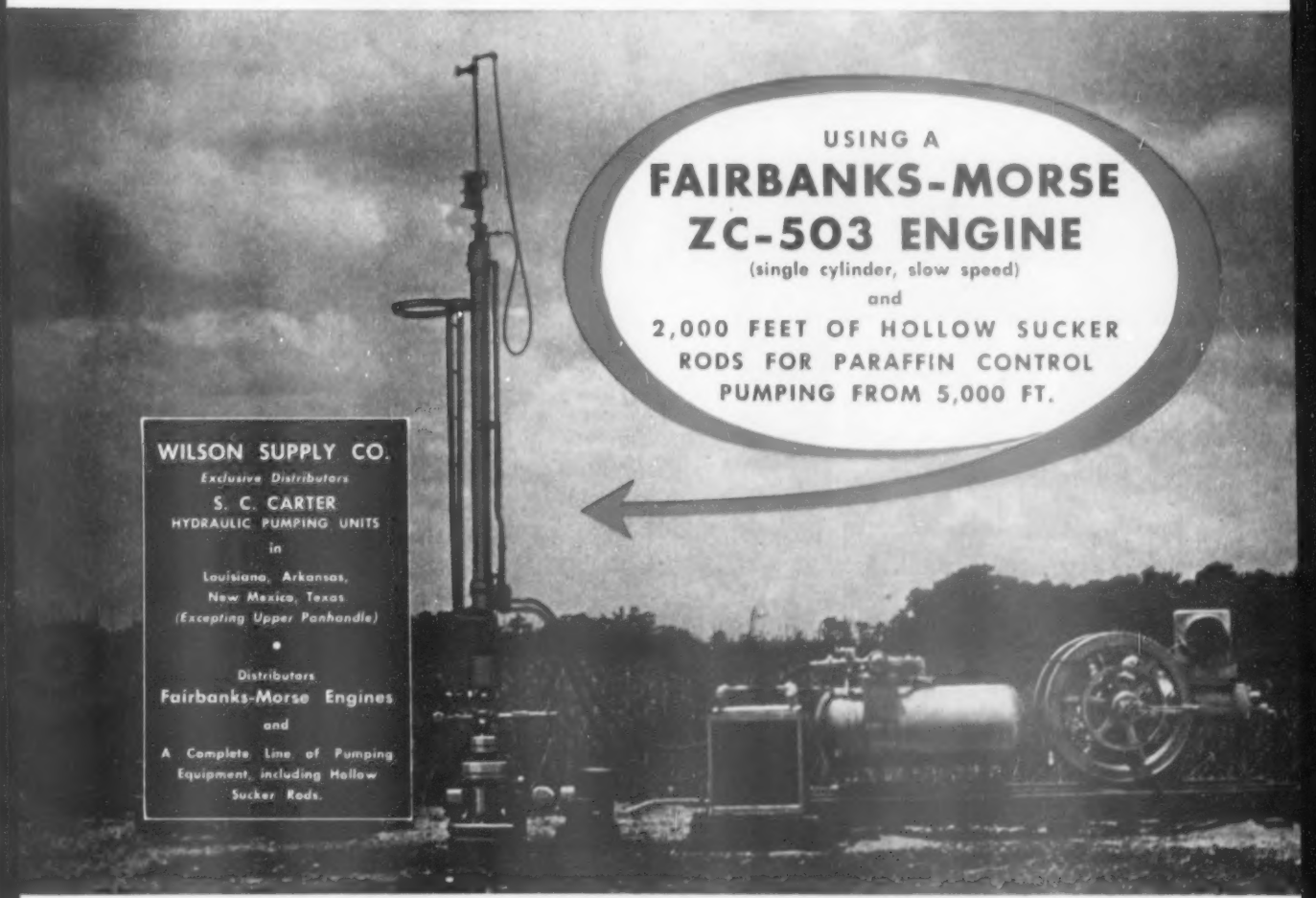
This installation of a Carter Hydraulic Pumping Unit is in the Phoenix Lake Field, Orange, Texas, on very swampy ground. A standard Pumping Unit would have required piling to be driven more than 15 feet deep and a strong foundation.

With the Carter Hydraulic Pumping Unit, only a shell base and skids were necessary—effecting a "double saving"—on the the original cost of the Unit and on the installation. This saving amounted to several thousand dollars.

Nine different sizes of Carter Pumping Units are available—a size and a price to fit your specific application.

NOW AVAILABLE in 10 ft. stroke, at slight additional cost.

Contact your nearest Wilson Supply Store or write Production Division, Wilson Supply Company, Drawer 19, Houston, Texas.



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LOUISIANA: Lake Charles, New Iberia, Houma, Harvey, Shreveport.

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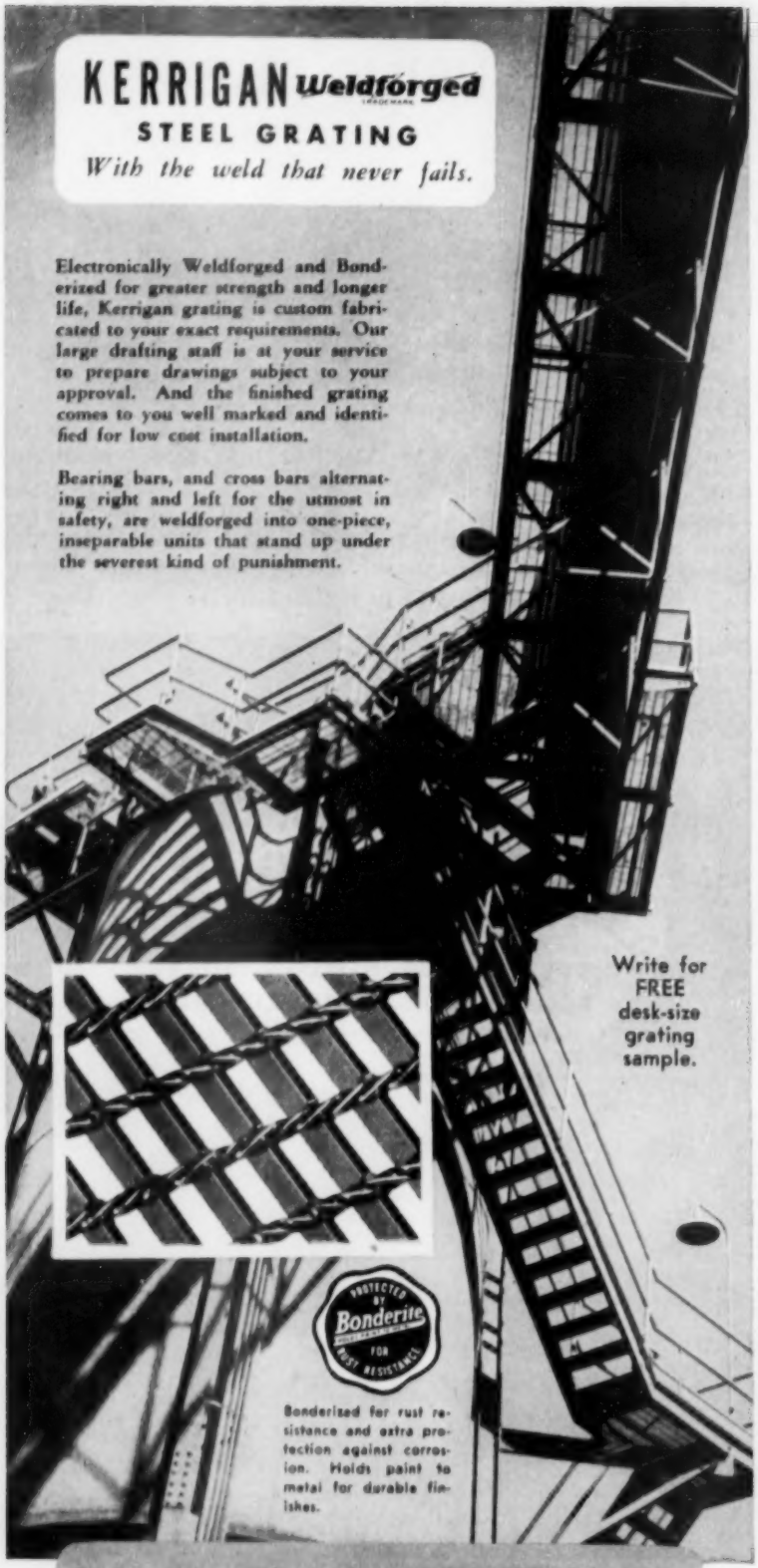
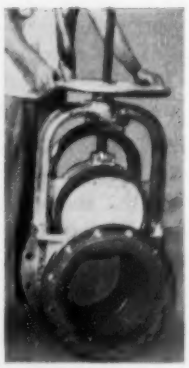

KERRIGAN Weldforged
STEEL GRATING
With the weld that never fails.
Electronically Weldforged and Bonderized for greater strength and longer life, Kerrigan grating is custom fabricated to your exact requirements. Our large drafting staff is at your service to prepare drawings subject to your approval. And the finished grating comes to you well marked and identified for low cost installation.
Bearing bars, and cross bars alternating right and left for the utmost in safety, are weldforged into one-piece, inseparable units that stand up under the severest kind of punishment.
Write for FREE desk-size grating sample.
PROTECTED BY Bonderite FOR RUST RESISTANCE
Bonderized for rust resistance and extra protection against corrosion. Holds paint to metal for durable finishes.
KERRIGAN IRON WORKS, Inc.
General Sales Office — 274 Madison Ave. — New York City

Kontol 149 is miscible in all proportions with aqueous ammonia and caustic solutions and may be mixed and injected through a single system. This enables the user to eliminate the additional pump and considerable auxiliary injection equipment. *Tretolite Co.*

Check No. 8 On The Time-Saver Card

●

Gate-Valve Line Blind Eliminates Plate Lifting



A new gate-valve line blind which has no bolts to loosen and requires no lifting of plates, offers the user the ultimate in simplicity. Operating on the gate-valve principle, the rising stem raises the blind plate from the valve body into line with a machined carrier track incorporated in the top of the valve yoke. Here the blind plate slides off the stem on to the carrier track, and the other blind or spectacle plate is then slid on to the valve stem and lowered into position.

This gate-valve line blind is positive as a shutoff blind. The standard O-ring secondary seal is employed in the wedges of this new valve. The new model blind is currently available in the larger sizes where lifting heavy plates is a particular problem. *Vernon Tool Co., Ltd.*

Check No. 9 On The Time-Saver Card

●

New Snubber Silences With Much Shorter Pipe Length

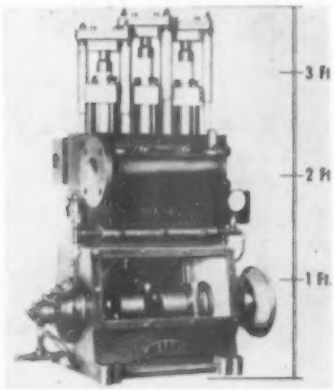
A new type of silencer is designed for use on the intake and discharge of centrifugal blowers where length is a limiting factor. The new silencer also may be used in other applications where silencing of high-frequency noise is required.

Known as the ACA series, this snubber is an absorption-type silencer. Air flow is channeled through an annular passage which is lined with acoustically transparent tubes, backed up with deep layers of highly efficient, sound-absorbing material.

The silencer is offered as an alternate where diameter is not a problem but length must be kept to a minimum, and it accomplished excellent silencing results in a considerable shorter pipe length. This series is designed to han-

dle relatively moisture-free air up to 200° F., but can be used for considerably higher temperatures with use of special sound-absorbing materials. *Burgess-Manning Co.*

Check No. 10 On The Time-Saver Card



New Aldrich Pump Designed With Direct-Flow Fluid End

Called Powr-Pac, a new pump is a 2½-in.-stroke, 25-hp. direct-flow triplex unit. Designed to provide industry with a serviceable pump at lower cost, this pump embraces the direct-flow fluid-end principle.

Because of its relatively small size, Powr-Pac offers economies to users who previously have been forced to buy pumps larger than actually needed. One outstanding feature of the unit is the sectionalized fluid-end design. Individual fluid-end sections are easily replaced at a fraction of the cost of the entire fluid end. Working barrel can be furnished in carbon steel, aluminum bronze, stainless steel, or Hastelloy. Plungers are made of heat-treated carbon steel, stainless steel, solid porcelain, or bronze. Valve seats are available in aluminum bronze, stainless or hard-faced steel, and valves are available in aluminum bronze, Insurok, stainless steel, or nylon.

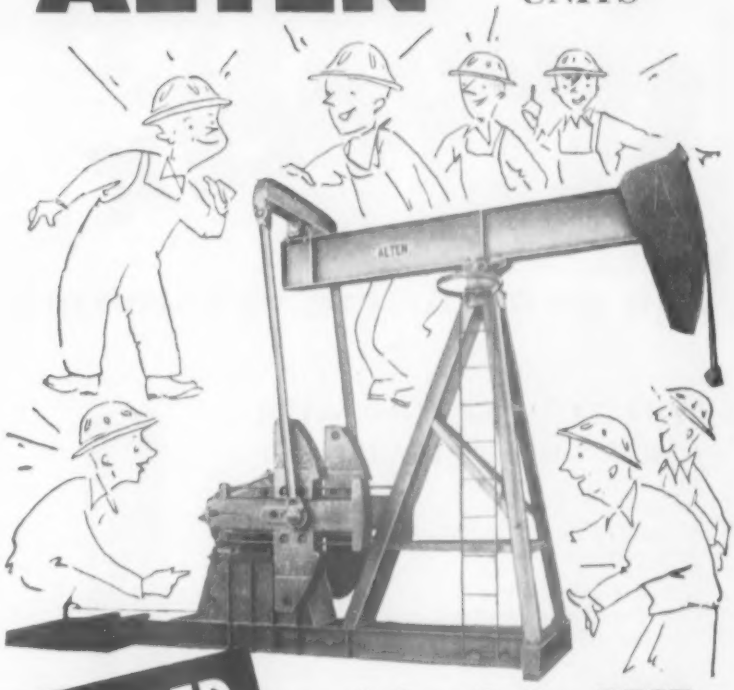
The pump is precision-machined throughout. Crankshaft is of high-grade carbon steel; the frame is semi-steel casting with power-end moving parts totally enclosed; and connecting rods are drop-forged, with babbitt-lined crank-pin bearings.

Lubrication is force feed from a crankshaft-driven, lube-oil pump. Main bearings are splash-lubricated, and a lube-oil failure cutout switch is standard equipment.

In sizes, the Powr-Pac is available in plunger diameters from 2½ to 11/32 in., for pressures from 390 to 20,700 psi., with displacement from 109.6 to 2.08 g.p.m. *Aldrich Pump Co.*

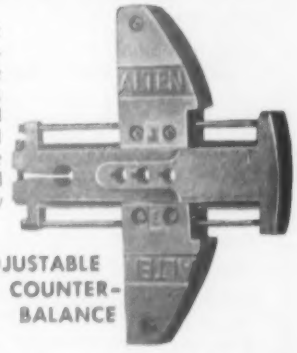
Check No. 11 On The Time-Saver Card

Why all the TALK about ALTEN PUMPING UNITS

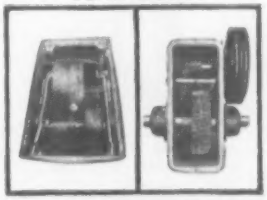


TESTED and found the BEST

Oil fields are buzzing about the performance records being established by the new Alten pumping units. The answer? *More pumping time!* An Alten unit is more than a green-painted, orange-trimmed steel structure. Take a close look and you'll find a carefully engineered machine. All parts have been ingeniously designed for longer life and quick, easy servicing. *Alten now makes every size and makes it better!*



TWO GREAT GEAR BOXES



Some pumping situations demand herringbone gears for peak performance, others helical. *Only Alten offers both.* No need to compromise — get the proper gear train every time.

NEW ADJUSTABLE COUNTER-BALANCE

Rugged enough to meet harshest oil field requirements, yet so amazingly simple it can be adjusted in minutes by one man on the ground.

Crank calibration locates weights for desired counterbalance. Weights cannot fall during adjustments — they are safely locked in position at all times.

4 WAY ADJUSTABLE SADDLE — BRONZE BUSHED BEARING

Matchless for long wear and convenience. Simply rotate to a new bearing surface and obtain several times ordinary life. Walking beam may be adjusted laterally and to and from the well for exact centering.

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ALTEN
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duplex

DUPLEX

.....a good name to remember

Baker DUPLEX Cement Wash-Down Whirler Float Shoe — Product No. 360

WHAT YOU CAN DO WITH BAKER DUPLEX EQUIPMENT

successfully cement liners, combination strings, and perform certain types of two-stage cementing.

cement blank sections of pipe below a perforated section, without any need to use auxiliary equipment.

wash out cavings ahead of the string when setting a liner. Without DUPLEX Equipment you can circulate only through the topmost perforations—with DUPLEX you can circulate clear to bottom.

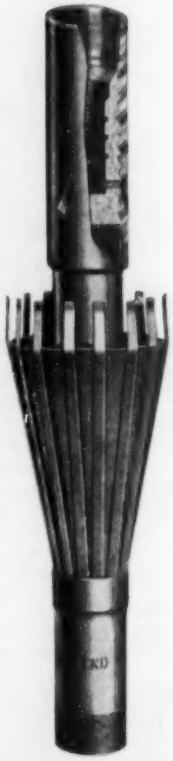
you can control the amounts of materials used, and (without change) run caustic or oil, then run plastic, in sequences and quantities as desired.

you eliminate the need for auxiliary equipment (such as retainers or retrievable cementers) when you use Baker DUPLEX.

you can use DUPLEX equipment either with or without a liner hanger.

you have complete control of the liner at all times when DUPLEX Equipment is used. The liner can be raised or lowered, and is positively held down in place while cementing.

a bridging ball can be dropped (after cementing) and circulation carried on above the DUPLEX Equipment without disturbing the green cement.



Baker Combination Product No. 383 with a DUPLEX Whirler Float Collar. Cement is held above the Metal Petal Basket.

How DUPLEX Equipment is made

DUPLEX Float Shoes and Collars are similar to other Baker Float Shoes and Collars in most features, but have a female left-hand thread assembly (of drillable cast iron) accurately anchored just above the Back-Pressure Valve. By means of a mating male Left-Hand Square Thread Sub, the cementing string is easily connected to (or disconnected from) the DUPLEX Shoe or Collar.

How DUPLEX Equipment Operates

In simple liner work, a DUPLEX Wash-Down Whirler Float Shoe is connected to the bottom joint and the balance of the liner is run into the well, with the last joint held in slips or clamps. A cementing string of sufficient length then is run to connect the male Left-Hand Square Thread Sub to the female left-hand assembly in the shoe, to form a quick, fluid-tight connection.

The portion of the cementing string above the liner is then run, with the DUPLEX connection carrying the weight of the liner. After cementing, the back-pressure valve prevents any flow-back of cement slurry placed outside the liner. The cementing string is then disconnected by rotating to the *right;* excess cement washed out; and the cementing string removed from the well.

Various combinations of Baker DUPLEX Equipment are used to perform more complex operations, such as cementing behind liners at different levels; cementing above and below cavities; between producing zones; and similar work.

The Baker representative or office nearest you is available to discuss proper use of Baker DUPLEX Equipment in your well completions.

BAKER OIL TOOLS, INC.

HOUSTON • LOS ANGELES • NEW YORK

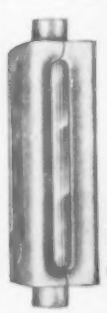
BAKER

GUIDING, FLOATING AND CEMENTING EQUIPMENT

DUPLEX

And I'm hoping to have a chance to tell **you** all about it before long. ★ I've been around a lot of drilling hooks in the years I have been in the oil patch, but that new Web Wilson HYDRA HOOK is so **far out in front** that the others just don't count. ★ That "dash pot" action is something you have to try out to really appreciate, but **one look** will tell you it's the most compact, streamlined drilling hook ever made. And that soft, controlled action is mighty easy on tool joint threads. ★ Maybe we had better get together and go over ALL its good points, so just call me at Corpus Christi 2-5361 and I'll come a running!

E. E. (Gene) Buckner



INFERNO
High Pressure
Gauges
Are
SAFE!

Gauge glass in Inferno gauges is 1" thick, specially tempered and heat treated. This glass is held in the gauge by equal pressure on both sides around the entire edge of the glass. The body is available in three different metals, and is machined from solid bar stock. Write for Bulletin 23-A.

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They're NEW

- **Bulletins**
- **Catalogs**
- **Brochures**

for your copy, check ✓ ✓ the Time-Saver Cards.

Selective Telemetering Applications. A method that provides a satisfactory answer to selective telemetering is described in detail in technical bulletin ATK-929. It tells how a compromise can often be made to provide some information continuously, while other data can be selected when needed by the operator. The shared use of telemeter communication channels with supervisory control systems that permit actual remote control of valves and motors, not only reduces the original cost of transmitting equipment, but also cuts space requirements and permits the shared use of telemetering instrumentation and sensing devices. *Motorola Communications & Electronics, Inc.*

Check No. 12 On The Time-Saver Card

●

Guiberson 1955-1956 Oilfield Equipment Catalog. A new, enlarged catalog for the years 1955 and 1956 contains full descriptions, detailed engineering data, complete parts price lists, and numerous illustrations of Guiberson equipment. The catalog is strongly bound and printed in large readable type. Copy is confined to essential information and every listed item is priced and identified by individual part number. Exploded parts drawings assist in quick identification of replacement parts. *Guiberson Corp.*

Check No. 13 On The Time-Saver Card

●

Control Water in Oil and Gas Wells with SOS. Four-page bulletin explains the slurry-oil-squeeze cementing method and service for controlling water in wells. In this new method, a slurry of portland cement, a surface-tension reducing agent, and a nonaqueous carrying medium, is used to seal off points of water entry. *Dowell Incorporated.*

Check No. 14 On The Time-Saver Card

●

Petroleum Processing by Kaiser Engineers illustrates Kaiser facilities to handle the planning, design, and construction of petroleum and petrochemical processing plants. Services include process design, mechanical design, pur-

A BETTER BLOCK
FOR EVERY PURPOSE.

Scottie McBlock takes a close look at seals.

Check construction of your proposed Traveling Block.

***Positive* grease seals eliminate undue loss of lubricant, stop entrance of grit, sand and foreign material into bearing cavity.**

Johns-Manville "Klipper" seals on all McKissick Traveling Blocks offers *positive* protection.

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McKISSICK PRODUCTS CORPORATION
Box 2496 Tulsa, Oklahoma

Famous PK ranch

SHERIDAN, WYOMING

can be yours

Opportunity: Seldom are great ranches offered for sale in this sought-after location.

Location: Along the foothills of the snow-capped Big Horn Mountains in scenic magnificence.

Buildings: Elegant spacious residence, guest house, swimming pool, manager's home, all buildings immaculate and in perfect condition. A great beef producing ranch PLUS a home in the West.

Ranch: Economical operation for over 1000 head. Cattle have national reputation—command premium prices.

Wire us: Priced for immediate sale. Send for pictorial brochure of the great PK, or other fine Western ranches.

VAN SCHAACK LAND COMPANY

624 Seventeenth St. Denver, Colorado

This announcement is neither an offer to sell nor a solicitation of an offer to buy any of these securities. The offering is made only by the Prospectus.

NEW ISSUE

Producing Properties, Inc.

$7,500,000 5% Debentures due 1969

100,000 Shares 6% Preferred Stock
Par Value $25 per Share

1,000,000 Shares Common Stock
Par Value 10¢ per Share

Offered in units consisting of $75 principal amount of Debentures, 1 share of 6% Preferred Stock and 10 shares of Common Stock.

Price $106 Per Unit

Copies of the Prospectus may be obtained from the undersigned only by persons to whom the undersigned may legally offer these securities under applicable securities laws.

Hemphill, Noyes & Co. Shields & Company Rauscher, Pierce & Co. Inc.

Dominick & Dominick Ladenburg, Thalmann & Co. Spencer Trask & Co.

Wertheim & Co. Clark, Dodge & Co. Drexel & Co.

L. F. Rothschild & Co. Shearson, Hammill & Co.

November 18, 1954.

chasing, expediting, field erection, and initial operation of a complete refinery or for the addition of new cracking, reforming, polymerization, desulfurization, distillation, visbreaking, coking, gas recovery, alkylation, or petrochemicals units. Experience also includes design and construction of pump and compressor stations. *Kaiser Engineers, Division of Henry J. Kaiser Co.*

Check No. 15 On The Time-Saver Card

●

Automatic Blow Cases. Catalog 37-15 covers gas-powered high-volume pumps that are completely automatic and operate on either air or gas. The unit receives liquid at low pressure and discharges it at pressures up to 2,000 psi. The blow case has three main applications: as a booster pump to prolong the flowing life of a well; in state separation where it permits the second or third separator to operate at pressures as low as 3 to 4 lb.; and as an automobile drip on low-pressure gas lines. Well illustrated with cutaway drawings in color, dimensional silhouettes, and detailed perspective drawings, the new four-page catalog section also gives fluid capacities and solves a sample problem on how to determine power gas requirements. *Black, Sivalls & Bryson, Inc.*

Check No. 16 On The Time-Saver Card

●

Santolene J. Technical Bulletin No. 0-97 describes an addition agent which enhances the color stability of fuel oils, available in commercial quantities. Santolene J, also inhibits rusting and reduces organic sediment formation. A concentration of 25 lb. of Santolene J per 1,000 bbl. of fuel oil will stabilize the color and reduce sedimentation of most base fuels, according to trials conducted by the company. *Monsanto Chemical Co.*

Check No. 17 On The Time-Saver Card

●

Sandproof Oil Well Pumps. In addition to listings and prices on a complete line of plunger pumps, parts and accessories, this new catalog contains a section on care and maintenance of Thompson oil-well pumps. *Thompson Pump Co.*

Check No. 18 On The Time-Saver Card

●

Proper Oiling Insures Smooth Running and Maximum Output, a six-page fold-out, perforated for loose-leaf binding illustrates a line of automatic lubrication equipment for a wide range of machine operations. *Manta, Ltd.*

Check No. 19 On The Time-Saver Card

EQUIPMENT MEN . . . in the News

Moses Represents Western Supply In West Virginia

R. MOSES

Richard Moses has been appointed sales and service representative for the West Virginia area according to an announcement by James E. Hughes, vice president of the heat-exchanger divison of Western Supply Co., Tulsa. Moses is general manager of Process Instruments & Equipment Co., Charleston, W. Va.

Hughes stated that the appointment of Moses is in line with Western's recently activated plans to expand its heat-exchanger design and fabricaton program covering the chemical and petrochemical industries.

Moses become district manager for M. S. Jacobs & Associates, Inc., in 1947, selling process equipment and instruments to the chemical industry. In February 1954 he purchased the Charleston office and started his own company, Process Instruments & Equipment.

Henderson To Head Plastic Sales For National Tube

Robert K. Henderson has been appointed National Tube's manager of sales, plastic pipe, it has been announced by W. J. McKee, general manager of sales of this division of United States Steel Corp.

Prior to his graduation in 1936, Henderson began his employment with United States Steel in the open hearth department of Duquesne Works of the former Carnegie-Illinois Steel Corp. He transferred to National Tube in 1936 and was assigned to the New York district sales office as a salesman. In 1952, he returned to the Pittsburgh district as manager of market development for National Tube which position he has held until the present time.

Succeeding Henderson as manager of market development is Samuel W. Verner. Verner began his business career with Westinghouse Air Brake Co. as a service engineer in Chicago. In 1952 he joined National Tube division's general sales staff, where he has been the sales promotion assistant, market development.

An interior view of Fluid Packed Pump Co.'s new building shows 6 of the 10 honing machines in the plant.

Fluid Packed Pump Completes Honing Plant

Fluid Packed Pump Co., manufacturers of the Oilmaster line of down-well-pumping equipment, recently announced the completion of a large new honing building, another step in its current plant-expansion program.

The new building houses 10 two-spindle hones and the equipment necessary for precision straightening of barrels prior to honing, and gaging barrels after the honing operation. It also contains the central hydraulic-power system and central coolant clarifier which are necessary auxiliaries to the honing machines.

Since pump barrels range in length from 4 to more than 40 ft., and since all Oilmaster pump barrels are finished honed in one piece, it is necessary to have a honing machine capable of an extremely long stroke. The machines shown in the picture were designed, developed, and fabricated by Fluid Packed Pump Co. The two shortest honing machines will hone barrels up to 12 ft. in length in one operation. The seven medium-sized machines will handle 18-ft. barrels, and the one extremely long machine is honing 44-ft. barrels and can take care of longer ones when necessary.

Fluid Packed Pump Co.'s new honing building.

Thornton Is Speaker At Nomads December Meeting

Dan Thornton, left, governor of Colorado and well-known authority in the oil industry, will be the principal speaker at the president's program of the Houston Chapter of Nomads, December 13, at the Houston Country Club. He is pictured accepting a personal invitation to speak from R. K. (Bob) Franklin, president of the Houston Chapter. Governor Thornton is a native Texan and has had a successful career as an independent oil operator in addition to holding office as a state senator and governor of Colorado. Governor Allan Shivers of Texas is expected to attend the meeting to introduce Governor Thornton. The Nomad organization (National Oil Equipment Manufacturers and Delegates Society) is a society representing oil-equipment manufacturers throughout the nation. Top oil men from the Houston area will be guests of the Nomads for the meeting.

Bethlehem Announces Sales Department Promotions

Bethlehem Supply Co. has announced the promotion of H. D. Garbett to store manager of the Winnsboro, Tex., store.

A New Angle..

ON MIS-ALIGNING UNIONS by WECO

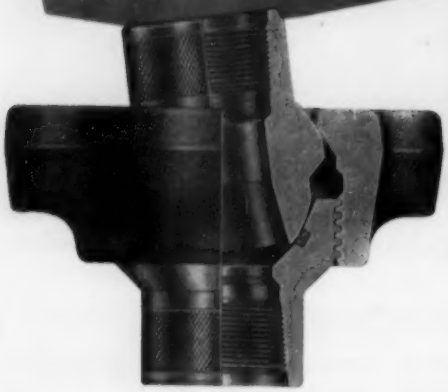
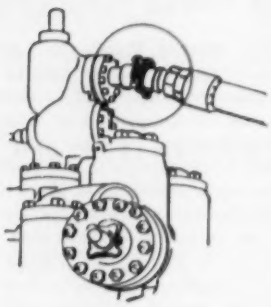


FIG. 603
6000 p.s.i.

• We have designed a number of important advantages into this new WECO Mis-Aligning Union that make it superior in sealing, service and durability.



1. 15° Mis-Alignment simplifies make-up.
2. Ball and Cone seat assures perfect sealing contact. "O" ring in female sub protects seat against corrosion and abrasion—is not essential to sealing.
3. Full flow area. The male sub does not project into flow-way under any conditions of mis-alignment.
4. The ball shoulder on male sub, in contact with angle on wing nut, assures maximum strength and support at any degree of mis-alignment.
5. 6000 p.s.i. NSCWP; 4000 p.s.i. at 350° F. Sizes: 2", 3", 4". Available with ends bored for welding.

PESA

it's wise to standardize with.. WECO

WECO WELL EQUIPMENT MFG. CORP. • Division of Chiksan Company • HOUSTON 1, TEXAS

H. B. Carroll, Jr., will be field representative at the Winnsboro store in order to give increased sales coverage in the area. W. C. Sheehan has been promoted to field representative in the Kermit, Tex., store.

Garbett has been employed by Bethlehem since 1939 and most recently was special representative in the Shreveport, La., area. Sheehan formerly was floorman at Sundown, Tex., and more recently clerk in the Kermit store.

Marlow Names Paris As Assistant Sales Manager

A. F. Woods congratulates F. R. Paris on the latter's appointment as assistant sales manager.

The appointment of F. R. Paris as assistant sales manager has been announced by A. F. Woods, sales manager of Marlow Pumps Division of Bell & Gossett Co. In addition to assisting Woods with sales policy, Paris will directly supervise all Marlow district engineers west of the Mississippi.

Paris has been with the company as a district engineer for the past 5 years and has been active in pump engineering and sales work for over 18 years. He is now located at the Longview, Tex., plant and will make his official headquarters there.

Armite Names Three Area Distributors

Armite Laboratories, Los Angeles, recently has announced the addition of three new distributors according to J. H. Armington, sales manager. Armite products are sold through supply stores and industrial jobbers, and these new distributors will be working with supply stores and jobbers.

Leon Walker, Rig Service & Parts, Ltd., Calgary, Alta., Canada, has been appointed to handle Armite products throughout Canadian oil fields. William Swan, Swan Specialties Co. was appointed to handle oil-industry sales in Williston basin and Wyoming areas.

DON'T

destroy your wire rope
before you use it!"

DO . . .

follow the manufacturer's recommendations to obtain maximum service in wire line."

The specialized customer service rendered by Broderick & Bascom and Continental on proper care of Yellow Strand Wire Rope assures you of longer life for your line and lowered line costs. Specify Yellow Strand to your Continental store.

Specify Yellow Strand®

CONTINENTAL
Serving the Oil and Gas Industries

Jay Robinson of Odex Engineering & Equipment Co. was appointed to handle West Texas oil-industry sales.

McCann Is New Mudwonder Valve Sales Engineer

E. C. McCANN

E. C. (Gene) McCann has been named Louisiana-Mississippi sales engineer for Mudwonder mud-line valves according to R. A. Durand, sales manager of Edward Valves, Inc., East Chicago, Ind., subsidiary of Rockwell Manufacturing Co.

McCann formerly worked for Delta Supply Co. in Houma, La., for Technical Oil Tool Corp., Lafayette, as field engineer, and for Houston Oilfield Material Co. as mud engineer.

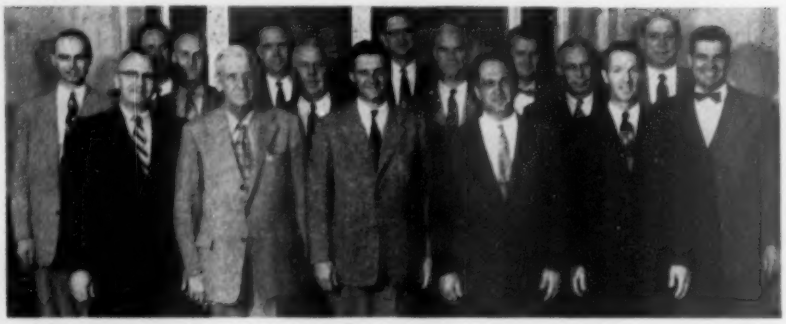
MacDonald Is New Bucyrus-Erie General Sales Manager

L. E. MacDONALD

Lawrence E. MacDonald has been appointed general sales manager for Bucyrus-Erie Co., according to an announcement from the company's mail office in South Milwaukee, Wis. MacDonald will take over responsibility for all domestic sales and will report to P. H. Birckhead, vice president in charge of sales.

MacDonald has served the excavator manufacturer for over 28 years. Since 1949 he has been sales manager, excavator distributors. Prior to that he had worked as a sales representative and manager of various sales and districts.

Shand & Jurs Holds Third Sales Conference



The third general sales conference held by Shand & Jurs Co. provided an opportunity for all of the men to observe the improvements in layout, machine-tool equipment, and production which have been instituted during the last few years. Prearranged sessions were held on subjects of automatic tank gaging (local as well as remote reading), storage-tank venting, and a wide variety of other equipment. Opportunities were taken to reveal new developments and improvements as well as better ways and means of serving the petroleum industry. Photographed at the conference were: Ralph Cayford, Lytle Engineering Specialties, Ltd., Montreal; Paul Neves, Nebar Supply Co., Seattle, Wash.; R. W. Blake, Shand & Jurs, Chicago; Cliff Lout, P. D. McLaren & Son, Vancouver, B. C.; A. E. Jurs, Sr., chairman of the board, Shand & Jurs, Berkeley, Calif.; as well as R. F. Ley, New York City; R. H. Smith, Los Angeles; P. C. Jurs, Berkeley; J. M. Greenlee, Houston; E. E. Jurs, Berkeley; R. J. Echeverria, Berkeley; H. M. Durham, Chicago; R. M. Young, president, Berkeley; Breen Ringland, Tulsa; J. T. Drumm, New York; and A. E. Jurs, Jr., Berkeley, all of Shand & Jurs.

McDaniel Will Head Foxboro Branch At Corpus Christi

W. G. McDANIEL

William G. McDaniel, formerly sales engineer with Foxboro Co.'s branch office in Houston, has been appointed manager of the company's branch in Corpus Christi, Tex., according to an announcement by L. W. Parten, district manager. McDaniel replaces W. A. Rock who recently joined the firm of Schultz y Cia., S. A., Foxboro representative in Mexico.

Fully experienced in all phases of industrial instrument engineering and specific applications in the petroleum, chemical, and gas industries, McDaniel has been a member of the Foxboro organization since 1949 when he joined the Dallas office as service engineer. Previously, McDaniel served in the laboratory and engineering departments of Coastal Refineries, Inc. (now Taylor-Mayfair Refinery), Port Isabel, Tex., and Taylor Oil & Gas Co., Corpus Christi.

Du Pont Assigns Key Men In Eastern Gulf Areas

New assistant managers have been assigned to the eastern and Gulf Coast regions of E. I. du Pont de Nemours & Co.'s Petroleum Chemicals Division, it has been announced by E. Hearn Simpson, sales manager.

Wesley T. Dorsheimer has been promoted to assistant manager of the eastern region. He replaced Barry V. Cornwall, who has been named assistant

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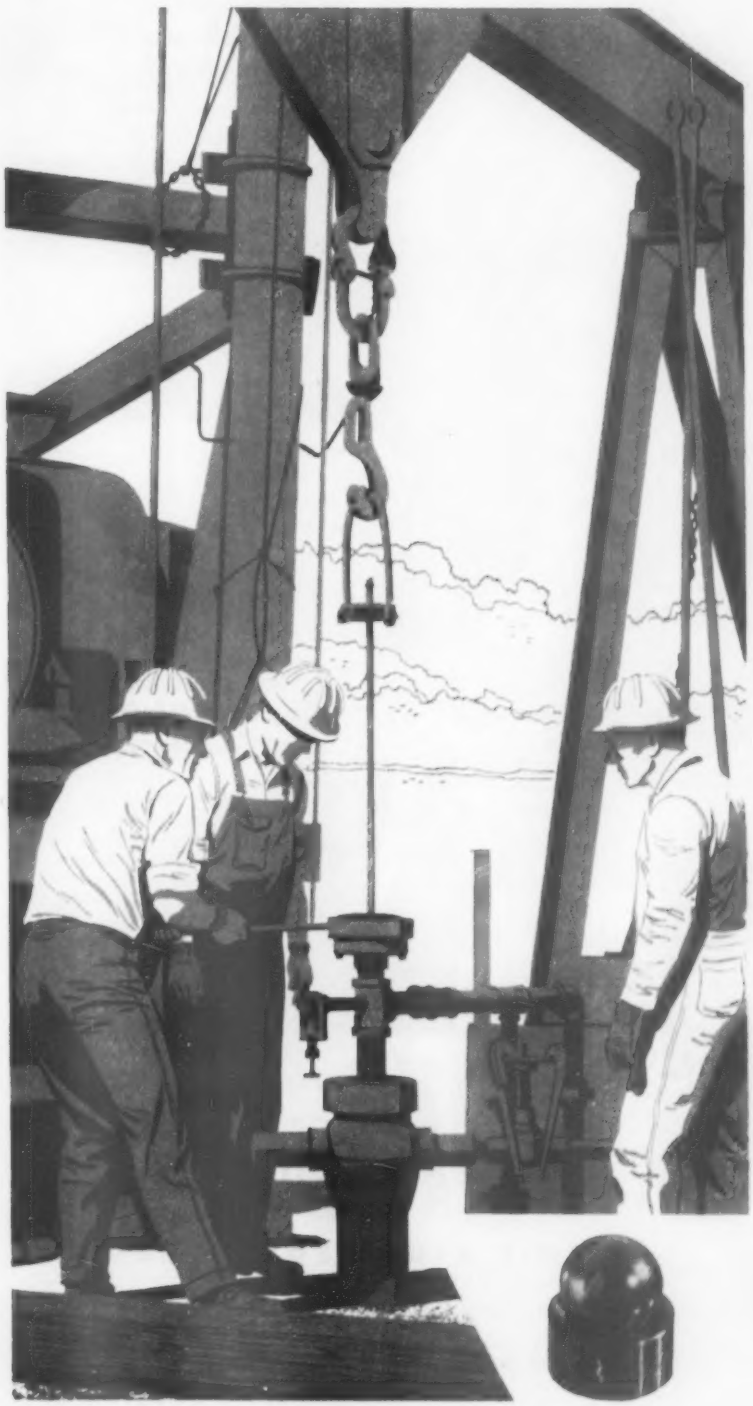
Kennametal* goes back down the hole **after 448 days**

...maximum life of previous valving—20 days



This West Texas producer pumped 168 barrels of oil a day from a well 2370 feet deep. Valve failure caused by sand abrasion of the balls and seats forced him to surface the pump every 14 to 20 days of operation.

After replacing the previous valving with Kennametal Balls and Seats, he got, at last report, 448 days of service before he pulled the pump—and this was for a problem other than valve wear. At that time, the Kennametal Balls and Seats were found to be in satisfactory condition and replaced in the cages. They are still on the job after having served over 22 times as long as previous balls and seats.

Figured in terms of the costs of string pulls, pump repairs and loss of production due to frequent valve failure in problem wells, it doesn't *cost* to use Kennametal, *it pays.*

Kennametal Sintered Carbide, API Balls and Seats are available at repair shops of most major pump manufacturers. Ask your service man to standardize on them. They'll cost you less in the long run.

KENNAMETAL INC., Latrobe, Pa.

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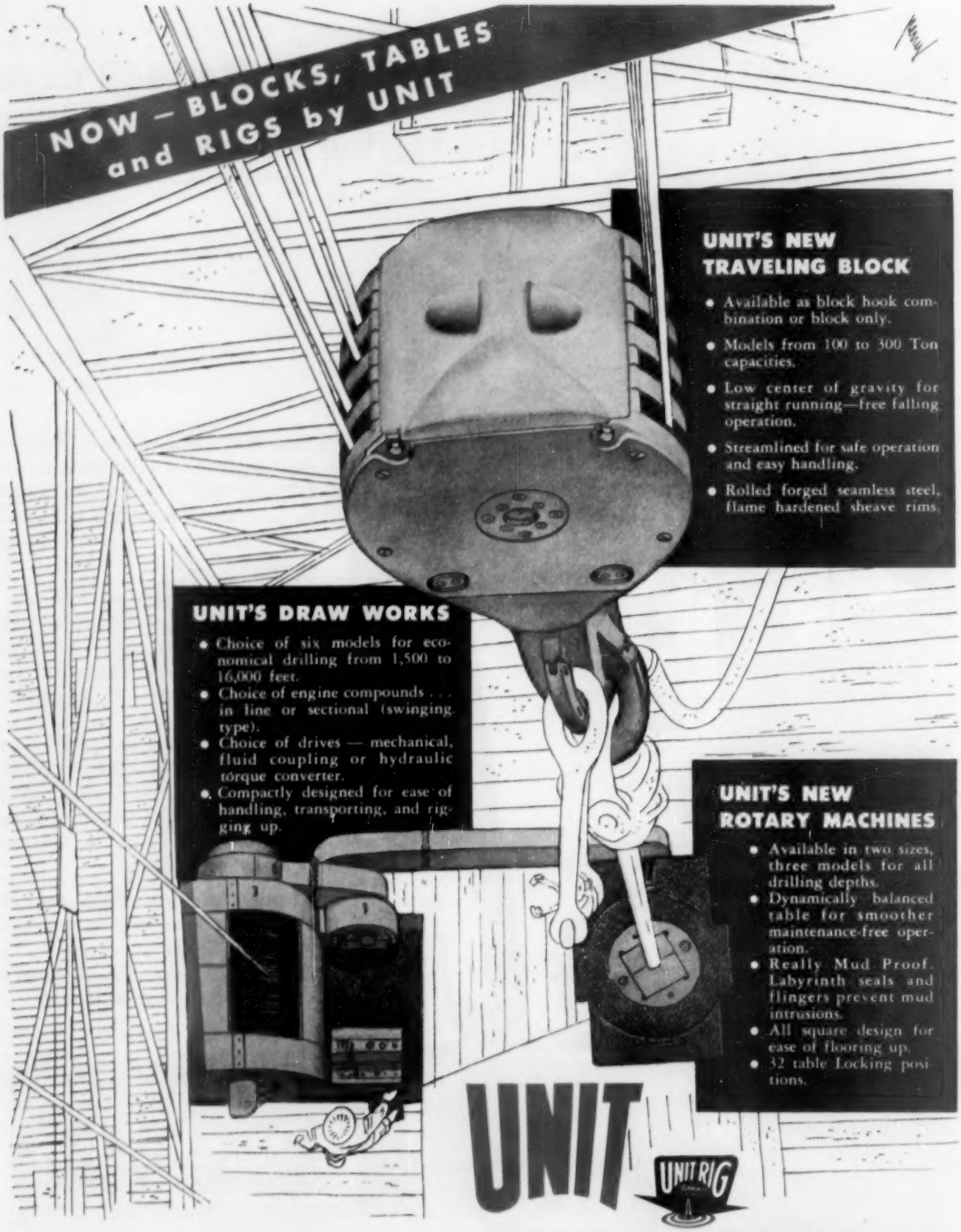
INDUSTRY AND
KENNAMETAL
. . . Partners in Progress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UNIT'S NEW TRAVELING BLOCK
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• Models from 100 to 300 Ton capacities.
• Low center of gravity for straight running—free falling operation.
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UNIT'S DRAW WORKS
• Choice of six models for economical drilling from 1,500 to 16,000 feet.
• Choice of engine compounds . . . in line or sectional (swinging type).
• Choice of drives — mechanical, fluid coupling or hydraulic torque converter.
• Compactly designed for ease of handling, transporting, and rigging up.
UNIT'S NEW ROTARY MACHINES
• Available in two sizes, three models for all drilling depths.
• Dynamically balanced table for smoother maintenance-free operation.
• Really Mud Proof. Labyrinth seals and flingers prevent mud intrusions.
• All square design for ease of flooring up.
• 32 table Locking positions.
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AND OTHER LEADING SUPPLY STORES

A-549

manager of the Gulf Coast region. Cornwall will fill the post formerly held by Robert F. Harwick, who has been named assistant sales development manager of the Du Pont Rubber Chemicals Division.

Dorsheimer, a chemical engineer, was an accountant manager in the eastern region. He joined Du Pont Co. in 1952. He was previously an engineer in the technical service division of Esso Standard Oil Co. in Bayway, N. J., and later assistant sales manager of the chemical industries division of Foxboro Co.

Cornwall joined Du Pont in 1929 as a technician in the service laboratory of the Dyestuffs Division. In 1947 he became assistant sales manager of the alcohol and camphor section, then joined the Petroleum Chemicals Division in 1952 as technical assistant to the director of sales.

Stone To Head Industry Sales For Layne & Bowler

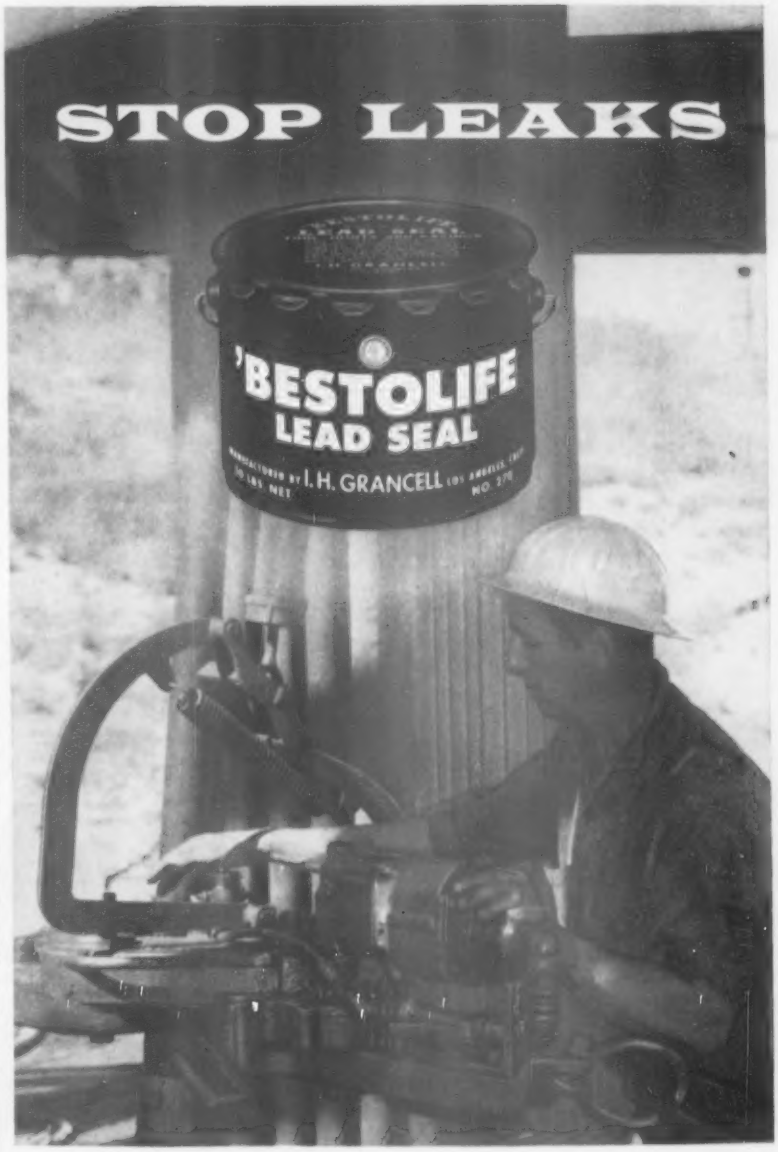
James W. L. Stone has been engaged by Layne & Bowler Pump Co., Los Angeles, to head industrial sales. Stone has been continuously active in the pump industry for 18 years. Past connections include both pump manufacturers and distributors, where he has held executive positions in sales and engineering.

Bodinson To Head Eastern Sales For Hammond Iron

E. H. BODINSON

The appointment of Earl H. Bodinson as eastern division sales manager with headquarters at the New York City offices has been announced by Ralph E. Kramer, vice president in charge of sales for Hammond Iron Works. Hammond, with plants at Warren, and Bristol, Pa., Birmingham, Ala., Provo, Utah, and Casper, Wyo., is a designer, fabricator, and erector of steel storage tanks and plate fabrication, including its patented Diaflote, Dialift, and Tubeseal oil-conservation-storage tanks.

Bodinson is well know throughout eastern oil and chemical industries, having spent 16 years in that area; the last 8 years with Hammond Iron Works. Recently he has been district sales manager at Bristol.



It is not easy to keep casing and tubing from leaking, especially in deep, high-pressure wells. The high percentage of metallic lead in 'Bestolife Lead Seal actually provides a plastic lead gasket for threads as joints are made up. That's why joints made up with 'Bestolife won't leak, strongly resist corrosion, and can easily be broken out—even years later. Your local supply store stocks 'Bestolife in 1¼, 5, 20 and 50 lb. cans. Unconditionally guaranteed.

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DRISCOSE low pH, low solid emulsion mud affords faster penetration and saves bits. A recent well history shows 20 feet more hole per day with DRISCOSE as compared with wells in the same field using conventional mud. In one well DRISCOSE accounted for a total saving of $23,303, representing a saving of 28.5% in drilling days and a 16.6% saving in number of bits used. Write for full information about the savings effected by DRISCOSE.

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EXPLORATION

Western Kansas Finds Its First Arbuckle Oil

by Frank J. Gardner

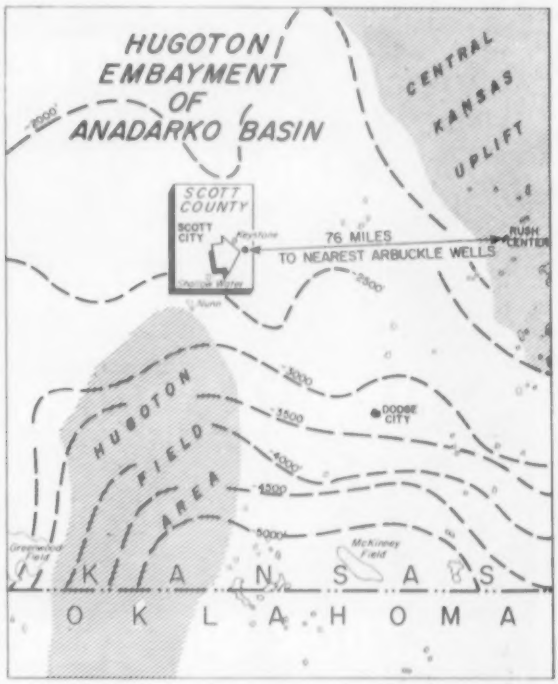
KANSANS are conservative when it comes to predictions about the oil possibilities in the western part of their state; there have been too many disappointments, too many "flash-in-the-pan" strikes, and too little real encouragement there to kindle much enthusiasm over the prospects.

A new target . . . But this week, a new discovery in Scott County has aroused more than ordinary interest, for it adds a new reservoir target to the oil finder's list of objectives in the 25,000-sq.-mile area of the Hugoton embayment.

Previously, most western Kansas wildcats have been aimed at the Mississippian, for it was believed that the best production prospects lay beneath the weathered and eroded surface of that formation at depths of 4,000 to 5,000 ft. The Arbuckle had never offered real promise in the few tests that reached it.

W. L. Hartman 1 Rush (arrow on map) has changed the picture. It is being put on pump for calculated potential of 144 bbl. per day as the first Arbuckle discovery west of the great Central Kansas Uplift. You have to look 76 miles east to find the next Arbuckle producers at Rush Center field. And unless the 1 Rush is another flash-in-the-pan, that's news. Good news. Up to now, Rush Center was the most westerly field in Kansas to produce Arbuckle oil.

And a surprise discovery . . . The discovery well, located in Section 10-19s-31w, lies 10 miles southeast of Scott City. It was drilled to bottom (5,078 ft.) as a tight hole, but as usual the dope leaked out. Reports had it that a drill-stem test of the Pennsylvanian-Lansing-Kansas City section had recovered oil. A lease play followed. Later reports of 1,000 ft. of free oil on a 1-hour Mississippian test at 4,550-70 ft. really set the rumors flying, but the operators pulled their biggest surprise by announcing the Arbuckle completion at 5,050-54 ft. On final tests, the well was swabbed for 6 bbl. per hour natural and pump was installed for completion.



First Arbuckle production for western Kansas has been discovered in Scott County (arrow above). Contours show approximate position of top of Arbuckle in western third of Kansas.

The nearest production to the new field is at Keystone, 4 miles northwest, where oil was discovered in the Lansing-Kansas City in 1951; 14 miles southwest lies the old Shallow Water field, which has produced from the Pennsylvanian-Marmaton limestone for the past 20 years. One deep test in Keystone field, Herndon Drilling Co. 1 Chance, found the Arbuckle dry at 5,064-5,106 ft.

Call for deeper testing . . . What will this strike mean? Probably no spectacular play will develop, but certainly a new interest in defining Arbuckle targets over the entire western third of Kansas is in order. The counties adjoining Scott County (Finney, Gove, Lane, Logan, and Wichita) already are feeling the effects of lease buying, but no concentration of interest would seem justified in the light of the widespread occurrence of the Arbuckle over all of western Kansas. The important thing is that future wildcats on likely structures in the area must be contracted for ample tests of the formation before abandoning or completing in shallower beds. Even the Mississippian, which has yielded minor scattered fields throughout this part of the state, must be regarded as sparsely tested. The Arbuckle has been even more feebly probed; for example, of the 25 exploratory wells completed in 1952 in the counties named above, not one went deep enough to top the Arbuckle. Both formations offer much greater potentialities than have been acknowledged heretofore. The Arbuckle is the most prolifc reservoir in eastern Kansas—there seems little to condemn it in the west.

A few deep wells have penetrated the Arbuckle group completely in western Kansas, and have reached pre-Cambrian rocks. Sample examinations reported from these wells indicate that the group can be subdivided into units solely on the basis of lithology, and that the units can be recognized over the entire area and easily correlated from well to well. On the map on this page, the approximate subsurface attitude of the Arbuckle is roughly sketched in, simply to show the blanket occurrence and general subsurface conformation. The entire area west of the Central Kansas Uplift is Arbuckle hunting ground.

Conservative Kansans can look forward to a lively exploration campaign on the basis of this discovery.

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THE JOURNAL REVIEWS . . .
EXPLORATION ACTIVITY IN OCTOBER
A Dakota gas discovery in LaPlata County, Colorado, roused further interest in the little-explored area west of Ignacio and east of Red Mesa . . . The search for Mesaverde (Cretaceous) gas production in the Green River basin continued at a fast clip with success reported on the Southwest Table Rock Unit . . . Green River (Tertiary) gas production was found at a test in Rio Blanco County, Colorado . . . Arizona entered the family of producing states, the nation's thirtieth.
True & Brown 1 State-Klein flowed 110 bbl. of oil daily to become the second discovery in recent weeks in the extreme southeastern corner of the Wind River basin . . . A Jackson County Lakota discovery revived sleepy interest in Colorado's North Park basin . . . The California Co. completed 8 Neiber Dome in Washakie County, Wyoming, for 258 bbl. of oil daily from the Tensleep, the dome's first such production.
California got its first offshore production. Monterey Oil Co. completed the first test from its drilling island 1½ miles offshore from Seal Beach for 300 bbl. of oil daily . . . Recent successes in the vicinity of Huntington Beach, Orange County, spurred wildcat activity in this California area.
Pennsylvanian exploration and development in the Hugoton embayment showed no signs of letting up . . . Beaver County, Oklahoma Panhandle, for 2 years relatively quiet, attained a new high in activity, promising an extensive drilling program in the coming months . . . Sinclair's Marshall County wildcat in southern Oklahoma promises to be of great exploratory significance with seven pay zones tested.
Humble's 2 Rita Provost-Minvielle in Weeks Island field, Iberia Parish, Louisiana, became the second deepest producer in the world, being 248 ft. deeper than the previous record-holder in the same field . . . Continental Oil Co. uncovered another new oil field 4 miles offshore in the Mississippi River delta sector of Plaquemines Parish . . . The CATC group recorded a distillate discovery at its first test of a 38,000-acre lease block 17 miles off the coast of Cameron Parish.
West Texas' new Ellenburger trend got its fourth oil discovery in recent months . . . Pan American Production Co. and Murphy Corp. 1 West, a potentially important Ellenburger hit in northeast Crockett County, was completed flowing 163 bbl. of oil per day . . . One of the biggest gas-distillate strikes in recent years was finaled in Winkler County . . . A Reeves County discovery opened the Delaware basin's third area of pre-Permian production.

California Goes Offshore in October

by John C. McCaslin

OCTOBER began an era of great expectations for the West Coast. A month of great discovery success throughout the country was highlighted by the opening of California's first offshore production from an offshore structure. The Pacific Ocean tidelands success came at Monterey Oil Co.'s drilling island at Seal Beach.

Although the year 1954 has seen fewer wildcats drilled so far, it nevertheless promises to be a period of significant discoveries and deep footage records. Ever-busy West Texas continued its deep Ellenburger play, while newsworthy developments kept the records hot in the Rocky Mountains, Hugoton embayment, southern Oklahoma, and the Louisiana Gulf Coast.

Seal Beach . . . Monterey's 75-ft.-diameter drilling island, 1½ miles offshore from Seal Beach, paid off with its first oil well and the first oil production offshore on the West Coast.

The discovery finaled for 300 bbl. of 26°-gravity oil per day at 5,906-6,280 ft., reportedly in a zone equivalent to the Ford pay at Wilmington field. The discovery well is now shut in, pending completion of a pipeline to shore. It was drilled vertically to 10,162 ft. without finding the basement expected at 7,000 to 9,000 ft.

Southern California's three producing basins are all considered to offer offshore oil possibilities. The Santa Maria, Ventura, and Los Angeles basins are all believed to extend into the ocean for some distance. All are believed to have tidelands counterparts of their onshore structural trends, sands, and sand problems. The Seal Beach hit is the first big step toward proving California's offshore potentialities.

The Ellenburger Bonanza

In Texas, southwestern Midland County's new Ellenburger producing trend received its fourth oil discovery in recent months. The area now extends from Headlee field in eastern Ector County southeast through the Roberts Ranch fields to Sweetie Peck and Pegasus in southwestern Midland County.

Forest Oil Corp. and Cities Service Oil Co. 1 Dora Roberts B-1 is the latest award winner on the trend. The success is more than 3 miles northwest of the nearest producer in Roberts Ranch and the same distance southeast of British-American Oil Producing Co.'s recent Headlee Ellenburger extension. That well was a major southeast extension and carried Headlee's limits into Midland County. The Dora Roberts B-1 discovery finaled for 2,168 bbl. of oil per day, based on a flow of 540 bbl. in 6 hours on 1-in. choke. The previous trend hits were: Cities Service-Forest 1 Roberts C-4, Warren Petroleum Corp. 1 Wallin, and Cities Service-Forest 1 Parks.

Old area rebounds . . . Winkler County in far West Texas got one of its biggest discoveries in recent years. J. C. Barnes and C. V. Lyman 1 Kerr had an initial potential of 2,424 bbl. of distillate and 160,000 M.c.f. of gas per day from the Ellenburger.

The well is significant because it lies along the west side of Central Basin Platform fields. A succession of similar deep tests along this trend of fields is seen as a result of the Winkler success. The discovery is 5 miles south of Kermit, inside old Emperor-Permian field. Emperor is one of the older producing areas in what is known as the "Sand Belt Trend." The big well also

(Continued on page 143)

Total October Completions, Exploration and Development

	Total comp.	Oil	Gas	Dry	Under 2,500 ft.	2,500-5,000 ft.	5,000-7,500 ft.	7,500-10,000 ft.	10,000-12,500 ft.	Over 12,500 ft.	Total footage	Active operations
Ala.-Ga.-Fla.	7	0	0	7	1	2	1	2	1	0	41,208	9
Arkansas	54	35	0	19	20	28	6	0	0	0	174,017	43
California	185	114	5	66	45	68	38	17	14	3	889,030	215
Colorado	117	28	6	83	6	27	76	6	2	0	629,545	117
Illinois	312	182	1	129	84	228	0	0	0	0	741,877	528
Indiana	67	19	2	46	61	6	0	0	0	0	108,717	89
Kansas	358	177	22	159	36	316	6	0	0	0	1,270,759	413
Kentucky	103	35	26	42	69	34	0	0	0	0	188,348	116
Louisiana	291	185	18	88	114	29	41	41	38	28	1,729,457	408
North	168	124	7	37	111	21	28	7	1	0	490,494	166
South	123	61	11	51	3	8	13	34	37	28	1,238,963	242
Michigan	53	28	0	25	22	24	7	0	0	0	173,683	138
Mississippi	46	20	1	25	0	2	29	10	5	0	333,205	46
Montana	30	14	1	15	8	15	4	3	0	0	116,917	63
Nebraska	54	23	0	31	0	10	43	1	0	0	302,298	42
New Mexico	96	47	31	18	14	38	26	6	5	7	518,341	130
New York	18	9	0	9	18	0	0	0	0	0	26,100	15
North Dakota	35	18	0	17	0	8	5	1	1	0	248,774	38
Ohio	113	41	32	40	64	48	1	0	0	0	239,274	171
Oklahoma	627	380	38	209	245	286	54	26	13	3	2,098,471	977
Pennsylvania	110	38	36	36	94	13	1	2	0	0	315,220	107
South Dakota	0	0	0	0	0	0	0	0	0	0	0	5
Texas	1,531	895	66	570	467	536	340	132	43	13	6,555,982	1,164
N. Central (7-B & 9)	627	346	2	279	326	212	87	2	0	0	1,833,084	262
West (7-C & 8)	323	242	5	76	33	129	92	36	23	10	1,787,747	398
Panhandle (10)	76	39	28	9	3	66	6	0	1	0	255,973	32
East (5 & 6)	85	51	7	27	9	38	22	14	1	1	454,119	94
Gulf Coast (2 & 3)	220	115	9	96	18	49	78	61	14	0	1,398,950	195
Southwest (1 & 4)	200	102	15	83	78	42	55	19	4	2	826,109	193
Utah	14	0	0	14	8	1	3	1	1	0	51,768	48
West Virginia	57	4	44	9	27	28	2	0	0	0	171,985	182
Wyoming	115	78	1	36	19	27	54	13	2	0	613,257	163
Miscellaneous	¶14	0	1	13	9	2	1	2	0	0	37,777	§16
Total October 1954	4,407	†2,370	331	*1,706	1,431	1,776	738	283	125	54	17,576,040	‡5,243
Total September 1954	4,312	2,298	348	1,666	1,464	1,660	719	323	99	47	17,038,563	5,295
Cumulative 1954	44,459	24,651	3,294	16,514	13,954	17,421	8,110	3,204	1,281	489	181,141,968	
Cumulative 1953	41,041	21,315	3,215	16,511	12,492	16,795	7,219	2,980	1,190	365	166,832,977	
Western Canada	220	126	21	73	64	102	46	6	2	0	817,802	
Alberta	112	60	21	31	21	44	40	6	1	0	481,979	
Saskatchewan	67	36	0	31	20	41	6	0	0	0	223,733	
Manitoba	38	30	0	8	23	15	0	0	0	0	91,783	
B.C.-N.W.T.	3	0	0	3	0	2	0	0	1	0	20,307	
Cumulative	1,727	983	133	611	397	806	435	77	10	2	6,871,728	

*Incl. 78 service wells: Kans. 1, Mich. 1, N. Y. 9, Ohio 10, Okla. 28, Pa. 29. †Incl. 35 cond. wells: S. La. 10, Miss. 1, Okla. 4, Tex. Gulf Coast 13, S.W. Tex. 7. ‡Incl. all wells rigged up and/or drillirg at month's end. §Incl. Mo. 5, Tenn. 4, Wash. 2, Nev. 5. ¶Incl. Mo. 8, dry; Tenn. 1 gas, 1 dry; Nev. 3 dry; Wash. 1 dry.

. . . and the Month's Wildcats

	Total	Oil	Gas	Dry	Footage	1954 Comp.	1954 (1,000 ft.)	1953 Comp.	1953 (1,000 ft.)
Ala.-Ga.-Fla.	6	0	0	6	29,611	85	469	95	527
Arkansas	5	1	0	4	20,801	125	502	120	423
California	53	4	2	47	255,471	487	2,341	546	2,629
Colo.-Utah-Wyo.-Mont.	122	7	1	114	615,741	853	4,725	576	3,187
Tri-States	69	5	3	61	107,653	626	1,208	842	1,649
Kansas	65	10	2	53	262,421	604	2,386	759	2,877
Louisiana	46	10	4	32	397,685	459	4,177	435	3,827
North	21	4	1	16	109,042	157	895	146	853
South	25	6	3	16	288,643	302	3,282	289	2,974
Michigan	18	1	0	17	51,854	192	445	232	569
Mississippi	19	1	0	18	127,220	141	972	171	1,214
Nebraska	25	3	0	22	136,717	142	747	134	684
New Mexico	13	3	3	7	108,799	125	881	139	915
North Dakota	13	0	0	13	69,095	96	502	66	360
Oklahoma	63	20	1	42	301,400	684	2,956	650	2,839
South Dakota	0	0	0	0	0	18	88	16	84
Texas	380	50	11	319	1,827,729	4,374	21,588	4,460	21,951
North Central	167	22	2	143	556,116	1,756	6,081	1,809	6,488
West	63	7	3	53	351,873	820	4,949	738	4,441
Panhandle	10	1	3	6	52,560	85	487	21	106
East	22	5	0	17	134,290	269	1,410	250	1,268
Gulf Coast	62	8	3	51	461,583	704	5,202	751	5,359
Southwest	56	7	0	49	271,307	740	3,459	891	4,289
Others	17	0	5	12	75,770	127	562	82	324
Total October 1954	914	115	32	767	4,387,967	9,138	44,549	9,323	44,059
Total September 1954	872	111	33	728	4,250,133				
Cumulative 1954	9,138	1,287	321	7,530	44,548,699	9,138	44,549		
Cumulative 1953	9,323	1,333	318	7,672	44,058,633			9,323	44,059
Western Canada	64	6	4	54	244,698				
Cumulative	601	78	57	466	2,543,984				

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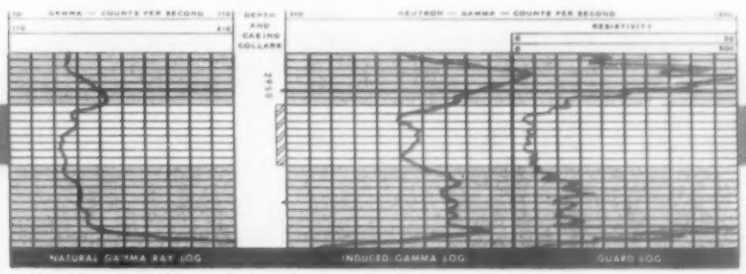
All the facts you need are readily available with this new combination of selected instruments and procedures. You get more facts and more accurate facts with the Halliburton Radiation-Guard Log system that has been tested and proved before being used at your well. Like Halliburton's eleven other logging techniques, you can rely on the proved ability of this new system to be more accurate, more complete and most economical. Call your local or district Halliburton office. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.



HALLIBURTON

ELECTRICAL WELL SERVICES

PERPETUAL PROGRESS IN PRODUCTION IMPROVEMENT TECHNIQUES

Active Drilling Operations

THE tables on this page show revised figures for active drilling operations at the end of each month of 1953 and the first 10 months of 1954.

The figures are from weekly scout checks and cover all tickets in the scouts' books except locations and current week's completions. Figures are for the check nearest to the end of each month.

The information is shown in the last issue of each month as the last column in monthly completion table. The total for a state may not be the same as the number of rigs operating since "active operations" includes all reports from digging pits through testing.

The completion table for October is on page 138 of this issue.

ACTIVE DRILLING OPERATIONS—1953

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Alabama-Georgia-Florida	10	14	10	14	19	18	11	16	16	15	14	14
Arkansas	39	41	39	40	41	67	56	74	68	58	77	72
California	273	272	265	263	273	261	255	257	256	250	240	253
Colorado	66	66	70	70	90	88	102	91	89	99	84	91
Illinois	284	253	267	297	316	327	346	370	396	408	430	399
Indiana	100	104	112	126	149	163	169	153	156	170	170	144
Kansas	457	483	501	435	428	471	443	463	362	390	376	411
Kentucky	95	97	96	116	107	113	126	125	116	122	118	112
Louisiana	289	283	288	313	296	290	319	317	357	361	384	393
North	90	83	84	109	113	123	119	121	142	131	145	157
South	199	200	204	204	183	167	200	196	215	230	239	236
Michigan	95	99	106	108	115	117	113	124	136	123	117	126
Mississippi	30	24	29	33	35	43	33	36	45	40	36	26
Montana	75	60	59	71	69	78	82	99	84	90	81	68
Nebraska	43	37	50	45	50	33	31	43	34	30	38	31
New Mexico	250	274	265	197	190	175	237	245	230	177	187	180
New York	55	66	65	53	54	55	55	100	53	75	65	65
North Dakota	40	31	30	38	35	35	36	38	46	35	36	37
Ohio	162	168	163	169	170	174	181	181	185	183	199	188
Oklahoma	955	841	922	993	1,029	1,096	1,098	1,149	1,104	1,103	1,258	1,358
Pennsylvania	140	160	155	150	155	115	115	280	150	180	190	190
South Dakota	3	3	3	6	5	7	8	5	3	4	5	5
Texas	1,126	1,216	1,271	1,260	1,152	1,172	1,272	1,112	1,134	1,192	1,229	1,242
North Central (7-B & 9)	301	319	338	331	319	323	318	282	292	316	323	351
West (7-C & 8)	286	321	376	387	313	340	429	314	342	368	364	355
Panhandle (10)	83	86	89	77	69	76	64	79	55	39	35	42
East (5 & 6)	49	81	101	89	81	86	89	98	72	104	108	123
Gulf Coast (2 & 3)	197	233	209	221	205	189	212	201	223	218	260	215
Southwest (1 & 4)	210	176	158	155	165	158	160	138	150	147	139	156
Utah	37	36	27	31	24	26	24	21	38	41	24	33
West Virginia	201	172	222	193	188	184	168	183	175	179	176	175
Wyoming	163	147	150	182	201	227	240	272	299	315	310	343
Miscellaneous	21	12	12	23	7	13	25	25	14	11	23	9
Total United States	5,009	4,959	5,177	5,226	5,198	5,348	5,545	5,779	5,546	5,651	5,867	5,965

ACTIVE DRILLING OPERATIONS—1954

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.
Alabama-Georgia-Florida	10	13	9	7	12	13	11	8	10	9
Arkansas	75	57	49	43	44	53	51	55	39	43
California	247	232	239	240	214	218	229	220	207	215
Colorado	122	119	136	130	124	122	110	93	107	117
Illinois	359	361	387	388	396	437	442	454	476	528
Indiana	126	109	102	106	105	111	101	84	84	89
Kansas	480	481	448	501	433	451	457	429	387	413
Kentucky	96	102	102	95	115	109	84	84	107	116
Louisiana	362	359	350	405	409	395	418	370	377	408
North	142	167	143	169	162	158	164	169	158	166
South	220	192	207	236	247	237	254	201	219	242
Michigan	129	100	110	121	139	136	139	136	140	138
Mississippi	28	27	35	36	38	43	42	45	56	46
Montana	53	41	33	37	33	62	62	58	52	63
Nebraska	35	31	26	45	49	62	59	42	44	42
New Mexico	140	110	106	114	123	103	102	111	103	130
New York	35	35	45	40	38	30	30	30	20	15
North Dakota	34	38	31	32	38	46	42	42	44	38
Ohio	183	179	187	171	173	174	187	184	167	171
Oklahoma	1,216	1,248	1,284	1,282	1,316	1,279	1,207	1,151	1,110	977
Pennsylvania	70	170	165	174	190	100	153	156	157	107
South Dakota	6	3	3	4	4	2	1	3	1	5
Texas	1,064	1,042	1,250	1,275	1,180	1,227	1,145	1,148	1,194	1,164
North Central (7-B & 9)	269	211	300	332	325	289	236	298	310	262
West (7-C & 8)	319	331	437	406	377	416	383	361	358	398
Panhandle (10)	29	51	53	32	33	41	46	40	49	32
East (5 & 6)	109	101	84	107	67	83	79	92	103	94
Gulf Coast (2 & 3)	192	197	191	214	219	210	208	179	213	195
Southwest (1 & 4)	146	151	185	184	168	188	193	178	161	183
Utah	32	30	32	39	38	40	41	47	39	48
West Virginia	175	161	162	171	194	194	171	212	187	182
Wyoming	314	278	248	217	229	205	198	192	183	163
Miscellaneous	12	30	14	24	13	13	17	7	4	16
Total United States	5,403	5,356	5,553	5,697	5,664	5,625	5,499	5,361	5,295	5,243

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- Synthetic rubber tube resists oil and abrasion
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had Devonian possibilities. In fact, Ellenburger success came as a surprise. Nearest pre-Permian production is at Keystone field, 10 miles northeast.

Delaware basin . . . Gulf Oil Corp.-Phillips Petroleum Co. 1 Toyah-Unit in Reeves County opened this basin's third area of pre-Permian production, promising to spark a deep drilling race.

Final potential at the gas discovery was a calculated 65,000 M.c.f. through open tubing from perforations at 12,570-12,610 and 12,690-12,795 ft. in the Silurian. The only commercial pre-Permian production in the basin is in Puckett field, Pecos County. The other area in the basin showing for production is in Lea County, New Mexico at Continental Oil Co.'s Bell Lake Unit. A lot rests on the outcome of these tests.

New Producing State

First production was assured for the State of Arizona at Shell Oil Co.'s 2 East Boundary Butte wildcat in Apache County. The northeastern Black Mesa basin wildcat was shut in after flowing 2,200 M.c.f. of gas per day and 11 bbl. of oil on a 13-hour test in the Pennsylvanian. The well is southeast of Utah's Boundary Butte field.

Sleepy Basin Awakes

The most significant single discovery in the Rocky Mountains was Lion Oil Co.'s North Park basin success in northern Colorado's Jackson County. The 1 Dwinell is a Lakota strike for an area that has seen little activity in recent years. The small intermontane basin has only one commercial producing area—North McCollam.

Western areas . . . Southwestern Colorado areas experienced a successful month. LaPlata County came up with a good gas well at U. S. Smelting, Refining & Mining Co. 1 Brown. The wildcat flowed an estimated 20,000 M.c.f. of gas per day. The well is 3 miles west of Ignacio field, adding further impetus to the growing exploratory race along the proposed route of the Pacific Northwest Pipeline.

OKLAHOMA

Ardmore Pool Gets Bromide Oil Producer

New Southwest Ardmore field in Carter County, southern Oklahoma, has a basal Bromide well at Stanolind Oil & Gas Co. 1 Simons, NE SE SW 23-5s-1e.

The well was treated and through perforations at 1,394-99 ft. it swabbed and flowed 130 bbl. of new oil in 3¼ hours. Daily rate is calculated at 760 bbl. with gas-oil ratio 500:1.

Southwest Ardmore field was opened at C. W. Tomlinson 1 Farve (Baptiste), SE NE SW 23. The discovery well flowed 629 bbl. of oil in 19 hours through ½-in. choke from perforations in the Tulip Creek at 1,709-76 ft. The 2 Farve, NE NE SW 23, is shut in after treating Tulip Creek perforations at 2,010-2,102 ft.

Grady County Wildcat Promises Deep Springer Pay

An important wildcat discovery for the ever-growing Springer trend in the Bradley area is reported.

Sinclair Oil & Gas Co. has indicated Springer production several miles northwest of the Bradley trend in NW SW SE 8-5n-5w. The 1 McClintock found the upper Dornick Hills at 11,180 ft. The Springer was entered at 11,713 ft. The Cunningham zone at 11,722-92 ft. showed 22 ft. of zone with about 17 per cent porosity, stain, and odor.

Skinner Sand Discovery Completed at Luther

Oklahoma County has a new oil discovery in the Luther area. C. H. Nicholson and Meridian Drilling Co. 1 Doster-A, SE SE SE 28-14n-1e, flowed about 10 bbl. of oil per hour natural on first production tests. Perforations were in the Skinner sand at 5,084-91 ft.

Bradley Area Report

Production tests are nearing completion at Phillips Petroleum Co. 1 Theodosia, SW SW 36-5n-5w, Bradley Townsite field, Grady County.

The well flowed 607 bbl. of oil in 23 hours through 14/64-in. choke through perforations at 12,398-12,570 ft. in the first and second

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- ☐ Handy Guide to Motor Selection — 51B6052
- ☐ Explosion-proof Motors (APZZ) — 51B7286
- ☐ Explosion-proof Motors (AZZ) — 51B7149

Pumps

- ☐ Handy Guide to Pump Selection — 52B6059
- ☐ Oil-Lubricated, Frame-type Pumps — 52B7638

Control

- ☐ Handy Guide to Starters — 14B7733
- ☐ Reduced Voltage Starters — 14B7215

Texrope Drives

- ☐ Handy Guide to *Texrope* Drives — 20B6051

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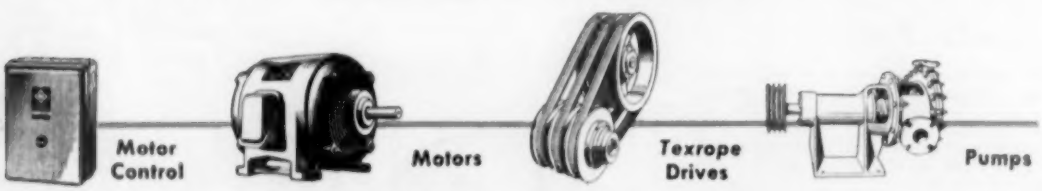

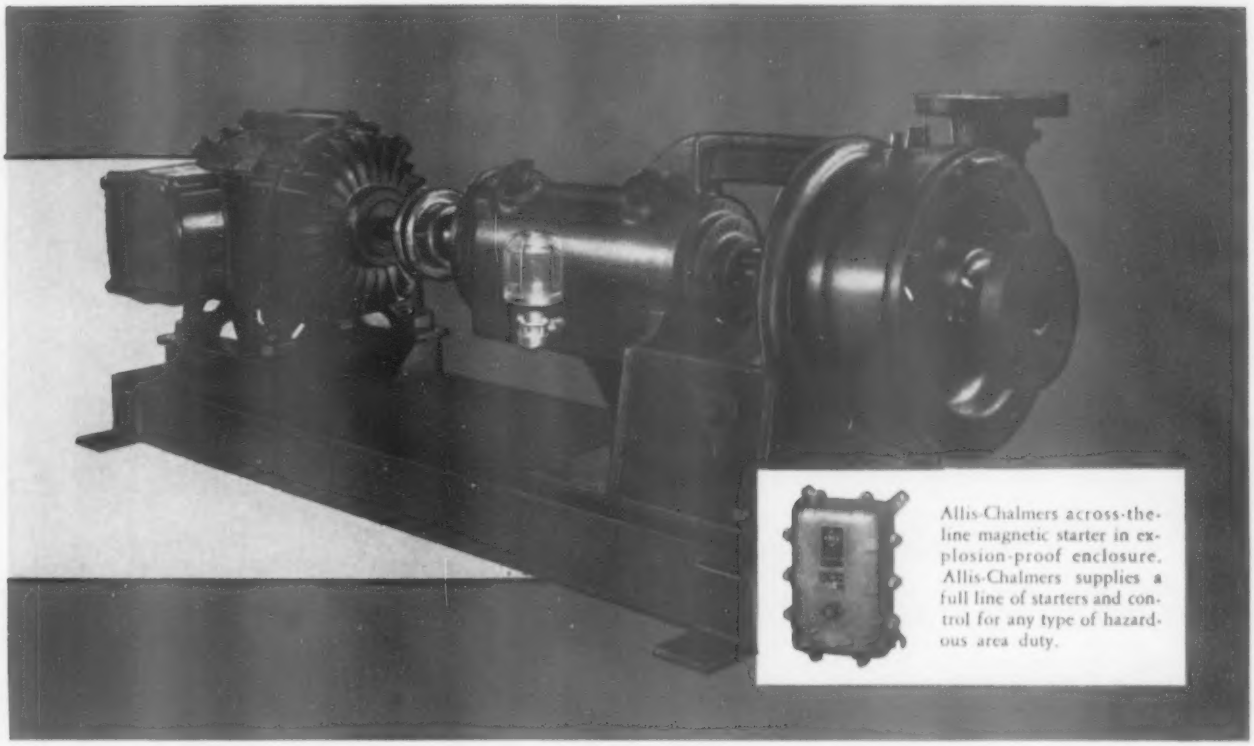

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MILWAUKEE 1, WISCONSIN

Bromide sands. The 1 Maxine, SW SE 26-5n-5w, showed for 110 bbl. in 22 hours from pay below the first and second Bromide sands, recovering only mud from the upper zones. Latest swab test got 22 bbl. in 4 hours to establish flow from the first and second sands.

Distillate Well Finaled In Garvin County's Purdy Area

The Purdy district in Garvin County has a gas-distillate well at Magnolia Petroleum Co. 1 Pratt-Williams, C NE NE 6-3n-3w.

The Hart well was treated to flow 360 bbl. of 63°-gravity distillate per day on 15/64-in. choke. The well had a gas volume of 5,060 M.c.f. per day. Gas-oil ratio was 14,050:1. Hart perforations were at 8,110-76 ft.

Gulf Oil and Toklan Well Tested in McClain County

Gulf Oil Corp. and Toklan Production Co. have tested their 1 J. D. Smith unit, spotted in the SW SE of 17-5n-4w, McClain County, Oklahoma, which is in Northwest Lindsay Pool.

On a drill-stem test at 11,027-11,213 ft., open 1 hour and 54 minutes, the well flowed gas in 16 minutes, at an estimated rate of 8,180,000 cu. ft. per day, and flowed oil in 20 minutes. The oil flow was gaged at 55 bbl. of 47° gravity in 33 minutes. It was drilling ahead.

APPALACHIAN AREA

OHIO

An extension to the old Nashport pool was brought in by Mid West Oil 1 (4) Frank Westbrook, 4th Qr., Jackson Township, Muskingum County. Clinton sand at 2,957-3,018 ft. made 425,000 cu. ft. and a good oil showing natural, and 1,150,000 cu. ft. and 200 bbl. in 24 hours after fracturing.

In Richfield pool the I. H. Hogue 1 Sheppard, Lot 3, Richfield Township, Summit County, made 44 bbl. and 600,000 cu. ft. after acidizing Oriskany sand, found at 2,133-2,211 ft.

A third gasser was completed in the Gnadenhutten extension, Clay Township, Tuscarawas County. Merle McCullough 1 Mauderly, 2nd Qr., gaged 780,000 cu. ft. natural from Berea sand at 846-853 ft.

WEST VIRGINIA

In Gore district, Hampshire County, West Virginia, M. E. Anderson 1 E. W. Dolan heirs, deep rank wildcat, elevation 1,204 ft., topped the Oriskany sand at 4,806 ft., and at 4,832 ft., struck a good flow of gas gaging 800,000 cu. ft., and is drilling at 4,855 ft.

Middle Fork district, Randolph County, P. C. McKenzie Co. 1 Elk Horn Coal Corp., elevation 2,289 ft., went through the Oriskany sand 7,105-7,204 ft., with no shows of gas and is drilling at 7,218 ft. Grant district, Jackson County, D. D. Foster 1 H. C. Milhoan wildcat, elevation 890 ft., had an initial open flow of gas testing 3,000,000 cu. ft., now down to 300,000 cu. ft., Oriskany sand 4,468 ft., gas 4,469 ft. TD 4,470 ft.

PENNSYLVANIA

Parker Township, Butler County, Southwest Pennsylvania, Walker et al 1 John Walker, encountered a fishing job at 7,275 ft. Grant Township, Indiana County, Fairman Drilling Co. 1 Herb Gernandt, drilled through the Oriskany sand at 7,671 ft., and shut down at 7,674 ft., with no gas. In Banks Township, Keta Oil & Gas Co. et al 1802 completed running the 7-in. casing at 7,498 ft., recording the chert at 7,488 ft.

TEXAS

WEST TEXAS

Ellenburger Trend Wildcat Running Potential

Completion test was under way at this report, on the latest discovery in the Pegasus-to-Headlee Ellenburger trend, which will move the northwestern end of that trend another 5 miles to the northwest.

The Texas Co. 1 Texas-Magnolia-Sallie W. Ratliff was acidized through perforations at 13,560-80 ft., and following several days of swabbing and flowing, finally was cleaned. On potential test the well flowed 508 bbl. of oil, with no water, in 21 hours through 48/64-in. choke. Flowing pressure was 250 psi. on tubing and gas-oil ratio was 1,150 psi.

Location of the discovery is in 25-42-T1S-T&P Survey, 8 miles north of Odessa, in Ector County.

In northern Midland County, Gulf Oil Corp. 1 Scharbauer was still trying to make an Ellenburger discovery. Perforations at 12,850-12,915 ft. developed 30 bbl. of water in 2 hours of swabbing. Earlier the well flowed 34 bbl. of oil in 6 hours on drill-stem test at 12,713-63 ft. This is the only interval that has yielded oil or shows, according to reports.

Devonian oil at Headlee extension . . . British-American Oil Producing Co. 2 Parks, west offset to the firm's recent southeast extension well which carried production across the Ector County line into Midland County, made a flow of oil from the Devonian.

Drill-stem test in the 2 Parks was from 11,685-11,916 ft. Gas surfaced in 18 minutes and oil in 278 minutes. When turned into tanks it made three hourly gages of around 5 bbl. an hour. Operators reversed out a full string of oil and drilled ahead. Flowing pressure on the test ranged from 360-1,040 psi. Sample-top on the Devonian was 11,527 ft.

SOUTHWEST TEXAS

Fourth Pay Zone Opened By Fifth Aguilares Well

The fourth productive zone for the steadily developing Aguilares field, in Webb County, has been opened with the completion by Skelly Oil Co. of its fifth consecutive well.

The new well, 2 Martin, approximately 1,690 ft. east of the field's discovery well (1 Martin), completed late last year, has a calculated open-flow potential of 16,350,000 cu. ft. of gas per day with a condensate recovery in the ratio of 53,700 cu. ft. of gas per barrel of liquid. Shut-in pressure is 2,256 psi. Production is from perforations at 6,872-78 ft. and 6,886-96 ft.

Wells in the field include two productive of gas and condensate from three zones (6,125 ft., 6,260 ft., and 6,890 ft.), and three oilers from two zones (6,465 ft., and 6,750 ft.) All zones are in the Wilcox section.

New Oil Field Opened By Nueces County Discovery

Republic Natural Gas Co. has a new oil-discovery well, its 1 Bevly, located 2 miles south of Clarkwood, west of Corpus Christi, in Nueces County.

The well, drilled by F. P. Zoch, Jr., and taken over by Republic for completion, flowed at the rate of 541 bbl. of 46.6°-gravity oil per day through 16/64-in. choke. Production is from sand interval at 6,094-6,100 ft.

Gas-condensate production previously had been indicated in drill-stem tests of sands at 7,152-73 ft. and 7,404-18 ft. Hole was drilled to 8,409 ft.

KANSAS

Arbuckle Shows Reported At Ellis County Test

Ellis County has a new Arbuckle oil field in prospect at Mallonee Drilling Co. and O. A. Sutton 1 Herman, NW NW NE 28-13-20w.

Recovery of 95 ft. of heavy oil-cut mud with bottom-hole pressure of 1,070 psi. was reported on drill-stem test at 3,861-65 ft. The wildcat then gave up 60 ft. of free oil and 15 ft. of muddy oil on a drill-stem test at 3,865-71 ft.

The new prospect is 1 mile northwest of production in Pleasant Northwest field.

Lansing Oil Recovered At Barton County Wildcat

Schermerhorn Oil Corp. and Thunderbird Drilling Co. show promise of establishing Lansing oil production at 1 Hart, NE NE NW 9-20s-13w, Barton County.

The wildcat recovered 60 ft. of heavy oil and gas-cut mud on drill-stem test at 3,216-41 ft. Also recovered was 360 ft. of muddy oil. The operators reported 2,220 ft. of gas and 30 ft. of heavy oil-cut mud and 70 ft. of frothy oil. This test was at 3,255-68 ft. Another test at 3,314-26 ft. flowed oil in 32 minutes. Current testing is at 3,361 ft.

Good Flowing Well Reported In Barber

Aurora Gasoline and Berwick Drilling Co. 1 Gudeman, NW NW NE 10-35s-10w, Barber County, is flowing at the rate of 80 to 85 bbl. per hour according to reports.

From perforations at 5,153-62 ft. the well flowed at the rate of 15 bbl. per hour for 12 hours and also from 5,153-66 ft. in the Viola. After acid treatment the good prospect flowed at the higher rate mentioned above. The discovery is located 1½ miles north of the Oklahoma state line, 5 miles east of Kiowa.

New gas pool . . . Barber has a new gas pool at Purcell-Mull 1 Barkley, SE SE NE 10-32s-14w. The discovery was completed for an open flow test of 47,000 M.c.f. of gas per day.

Production is from the Viola at 4,670-80 ft. It is 1 mile west of Little Bear Creek field, a Douglas (Pennsylvanian) producer. The wildcat strike is 5 miles south of Skinner field (Maquoketa-Viola gas production.)

KENTUCKY

EASTERN KENTUCKY

On Little Abbott Creek in the Floyd County sector of Big Sandy gas field, Kentucky West Virginia has completed 1034 Milt Stanley as a Mississippian Maxon sand gas producer. Maxon, topped at 901 ft. showed gas from 921 to 933 ft. total depth and gaged initially for 700,000 cu. ft. of gas daily on natural open flow.

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LOUISIANA

SOUTH LOUISIANA

Deep Production Opened On Bayou Boullion Flank

Sohio Petroleum Co., with Tide Water Associated Oil Co. and Welch Estate as joint operators, is opening a new, deep gas-condensate producing area, located on the northwest flank of the old Bayou Boullion salt dome, 15 miles northeast of St. Martinsville, St. Martin Parish.

The discovery well, 1 Lucie Martin, is shut in after cleaning and testing for 7 hours through 10/64-in. choke. No gage of flow was taken pending installation of completion equipment. Shut-in pressure is 3,750 psi. Productive zone is in Frio sand, perforated at 10,219-28 ft.

Location is 2 miles westward around the dome from the nearest production, in Miocene sand at depths of 2,500 to 4,200 ft., on the north flank of the dome.

Bayou Boullion, a shallow piercement-type dome, was proved productive in 1902, although first commercial production was not opened until 1928. Prior to Sohio's well, no drilling ever had been attempted on the northwest side of the dome.

Lirette Gas Field Gets Second Oil Producer

Humble Oil & Refining Co. is confirming its recent discovery of oil production in Lirette gas field, Terrebonne Parish. Its 8 Ellender is being completed as the field's second oil well, flowing at the rate of 297.60 bbl. of 37.9°-gravity oil per day through ⅛-in. choke from the new 11,600-ft. oil sand. Perforated interval is 11,612-18 ft. Flow was with gas-oil ratio of 1,056 cu. ft. per barrel under pressure of 3,325 psi.

Oil production in the field was opened last August by the company's 6 Ellender, completed with a flow of 366 bbl. per day through ⅛-in. choke. Gas production, from multiple pays, dates from October 1937.

HUGOTON EMBAYMENT

New Pay Reported In Southwest Camp Creek

Beaver County, Oklahoma Panhandle, reported a new-pay discovery in its Southwest Camp Creek field.

American Gas Producing Co. 1 Shadden, SE SE 26-3n-24eCM, 11 miles southeast of Beaver City, has gas production from Douglas-Pennsylvanian sand perforations at 5,476-94 ft. The well made 6,000 M.c.f. per day, open flow. It is 1 mile southwest of the Morrow gas discovery at Deep Rock Oil Corp. 1 Shadden "A."

Mocane area . . . Just 1 mile southwest of United Producing Co.'s 1 Evans, recently completed Mississippian-Chester gas discovery, the same company's 2 Evans, 3 miles northeast of Southwest Mocane field, has confirmed Morrow pay which was indicated in the field discovery well.

Grand Valley field . . . Production tests have begun at Carter Oil Co.'s 2-mile northwest outpost to Texas County's Grand Valley field.

The 1 Gibson, SE NE 21-2n-19eCM, flowed 3,310 M.c.f. of gas per day through 1-in. tubing choke from perforations at 6,463-75 ft.

Dallam County Has Its Second Producing Well

Dallam County in the Texas Panhandle has its second producing well at Humble 1 Kerrick Gas Unit 2 (Belo), Section 20, Block 1, I&GN Survey. It is 1 mile east of the discovery well for the field that opened the county's first production.

The second well flowed 3,000 M.c.f. of gas per day from upper Pennsylvanian lime.

Success Indicated At Hansford Link Well

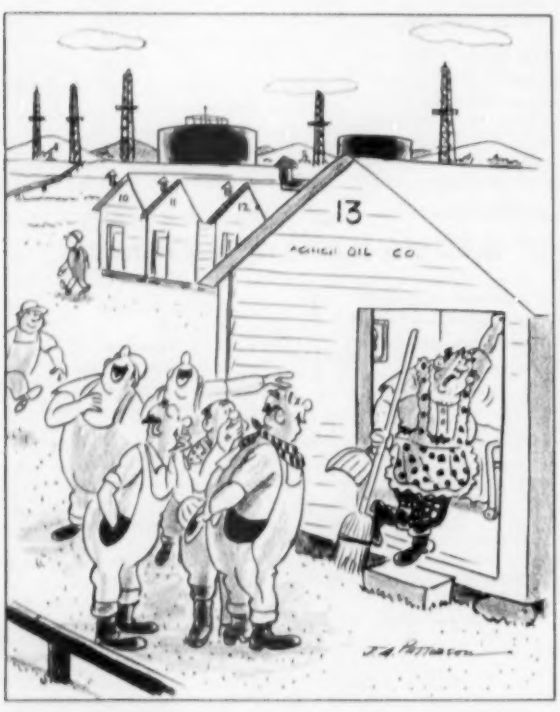
Humble 1 Gruver Gas Unit 7 (Sanders), 1½ miles each way from other production and 4 miles north of Hansford in Hansford County, Texas Panhandle, indicated success as a link between East Gruver-Penn field and R. H. Fulton's 1 Matthews.

The well flowed 2,000 M.c.f. of gas per day natural from Morrow sand perforations.

MICHIGAN

A very likely Richfield horizon oil discovery well in the Akron Detroit River "sour zone" oil pool, Tuscola County, was being tested and will be deepened further at the Byron A. Bartlett 1 Elek, NE SW SE 23-14n-7e, Wisner Township, on the northwest side of the shallower developed oil pool.

Well swabbed and flowed as much as 100 bbl. of free oil natural in 2 days after being



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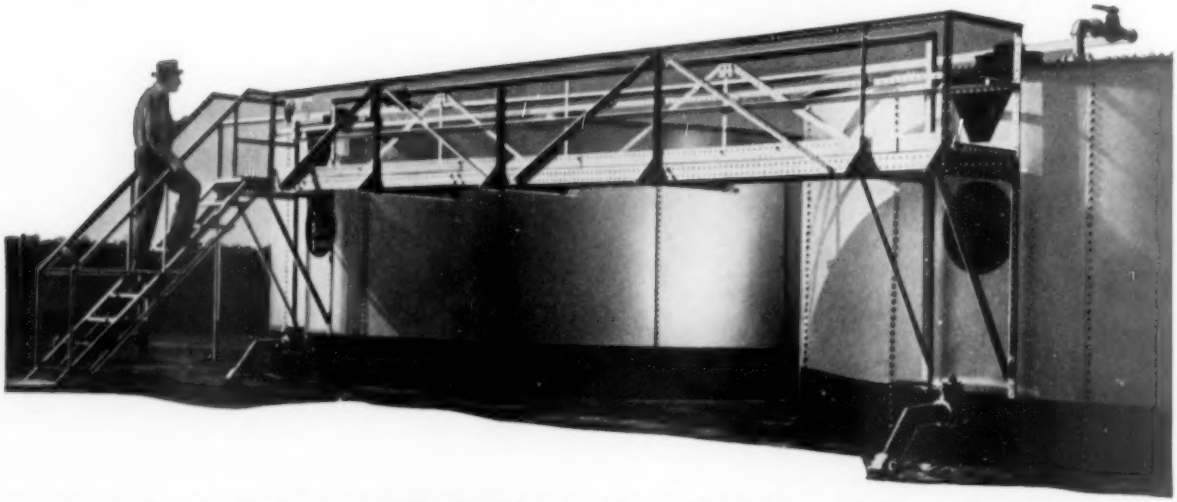

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shut in for about 3 days previously. Hole was temporarily bottomed out for test in this Richfield dolomite sand pay at 3,779 ft. Oil pays showed at various points from 3,673 ft. and oil stood within 400 ft. of the top when well was shut in to allow for tanks to be moved to lease. Five days later, well was opened and flowed 57 bbl. of oil to tanks and then quit. Flow was through 5-in. casing. The next day, hole was swabbed dry and an additional 43 bbl. was placed in storage. Further tests were being run and operator planned to drill further in the Richfield. It was believed that well may still be 100 ft. off Richfield base, the black lime. This is the fourth Richfield horizon test drilled in the Akron field area; the first to show an oil pay of significance.

A possible new Traverse oil discovery was being tested at the James J. McGerry, Trustee 1 Cook, NE NE NW 7-11n-11w, Ensley Township wildcat, Newaygo County. Wildcat logged top of Traverse lime at 2,431 ft. Hole carried 700 ft. of free oil natural on an overnight fill-up test at 2,440 ft., present depth. There was no evidence of bottom-hole water showing. Long string of 5-in. casing was to be run and cemented after hole was reamed from 2,413 ft. to the Traverse lime contact point. Wildcat is located about 2½ miles south of the Croton Marshall gas and Traverse oil pool in the same county. McGerry drilled this wildcat on acreage farmed from The Superior Oil Co. and Sun Oil Co. It appears to offer the best prospect of a new Traverse discovery for West Michigan of anything completed to date this year.

CALIFORNIA

Second Island Well

Monterey Oil Co. was under way with its third test after completing the second well from its drilling island 1½ miles offshore from Seal Beach. Its 4 Texas-State flowed 535 bbl. of 27.9° crude daily through a 24/64-in. choke. Perforated interval in the slant well was 5,293-6,300 ft., a drilled depth comparable to that at which the first island-based well was completed.

West Cat Canyon Extended

M J M & M Oil Co. completed 88-X Thomas as a ½-mile north extension to the West Cat Canyon field, Santa Barbara County. Initial production was 89 bbl. of 14° gravity crude daily, pumping. Production is from a sand in the basal Sisquoc (Pliocene) formation, and is believed to represent a new discovery for this area.

Airport Activity Up

Seven rigs were at work in the new Airport field northeast of Signal Hill field, making this development one of the most competitive since the Placerita boom in 1949. Texas Co., which discovered the prolific 8,500-ft. sand, had two rigs at work, as did Termo Oil Co. and Hancock Oil Co. The seventh was that of P. F. McKenzie, a northeast edge well. Paulin Oil Co. 2 I.C.I. remained shutdown due to lack of acreage to meet the state 1-acre requirement.

Seal Beach Test Watched

A Los Angeles Basin wildcat whose progress is being closely watched is that of Hancock Oil Co., midway between Seal Beach field and the recent deep discovery scored at Sunset Beach, about 2 miles southeast. The test, 1 Alamitos Land in 13-5s-12w, is drilling near 7,800 ft. according to field reports. These also credited it with an oil show at approximately 7,400 ft.

In NW NW 29-5s-11w, about ¾-mile southeast of the Burt Aston 2 Lomita discovery, Atlantic Oil Co. completed 1 Ramser for 488 bbl. of 29°-gravity crude daily. The flow was through an 18/64-in. choke, at a depth of 6,106-6,392 ft. in an Upper Miocene sand.

ROCKY MOUNTAIN

MONTANA

New Pay Tested At Northwest Sumatra

McAlester Fuel Co. has recovered oil from Amsden dolomite for an apparent new pay discovery in the Northwest Sumatra area of Rosebud County. Test of 2 NP, NE NW SE 7-11n-32e, recovered 1,850 ft. of 29.7°-gravity oil in 1 hour. Test was of the interval 3,961-75 ft., and flowing pressure was 60-745 psi. Shut in pressure reached 2,045 psi.

There has been no previous recovery of oil from this formation in Northwest Sumatra field. Previous production is credited to the Heath sandstone, and despite the Amsden showing, McAlester will drill ahead to test Heath. The well is ¾ mile west of previous production. Last reported drilling depth was 4,090 ft.

The Northwest Sumatra area has maintained a relatively constant level of activity during the past several months, with success generally good, although irregular sand lensing is apparent through the producing area.

Powder River County Wildcat Reported Complete

Although there has been no official confirmation or denial of reported success at George J. Greer's 1 Allen, SW SW SE 24-1s-49e, Powder River County, the well is reported shut in with production facilities installed. The well is in the Pumpkin Creek area of the county. It was unofficially reported a discovery in the Eagle sand, with a flow of 2,000 M.c.f. of gas per day from about 3,130 ft. The wildcat is one of a series of slim holes being drilled in the area by this operator.

WYOMING

South Baggs Discovery Gaged

Phillips Petroleum Co. and Kerr-McGee Oil Industries reported a flow of 2,800,000 cu. ft. of gas per day at 1 South Baggs-Government, C NE NW 9-12n-92w, Carbon County. The well produced from a stray sand in Lewis shale at 4,692-4,720 ft. Flow was at the rate of 734,000 cu. ft. per day before the formation was acidized and sand-fract.

These operators took the well from J. Ray McDermott & Co., who made the initial tests indicating a possible commercial gas producer. The well is now shut in. Location is 30 miles northeast of Powder Wash gas field in northern Colorado.

COLORADO

LaPlata County Gas Discovery Completed

U. S. Smelting, Refining & Mining Co. has reported a gage of 40,000 M.c.f. of gas per day at 1 Brown, C SE 15-33n-90w, in the Bondad area of LaPlata County. The well produced from Dakota with top of the formation called at 7,719 ft. The gage reported was through open tubing.

This wildcat was reported a discovery some time ago when it blew out with a flow estimated at that time at about 20,000 M.c.f. per day. The discovery is 3 miles west of Ignacio field.

WILDCAT COMPLETIONS

SOUTHWEST TEXAS

District 1

Atascosa County: Coastal Trend Oil & Gas Co. 1 Royal Locke, Galba Fuqua Sur., A-242. Dry. TD 1,806 ft.

Bexar County: Precision Prospecting, Inc., et al 1 Campbell, M. Gotaris Sur. 252. Dry. TD 1,553 ft.

Sharon Oil Co. 1 Esperanza Ranch, Mariano Sequin Sur., A-19. Temporarily abandoned. TD 3,191 ft. in Austin Chalk.

Guadalupe County: Producers Corp. of Nevada and Mac Drilling Co. 2 Blume, John G. King Sur., A-26. Dry. TD 2,166 ft.

LaSalle County: Horace Coon, Jr., and C. G. Dunwoody, Jr., 2 Storey, H&GN Sur. 141, A-268. IPP 89.3 BOPD, 38°, open hole 3,305-09 ft. TD 3,309 ft. (New field.)

Travis County: H. J. Stewart 1 Wells, John Harper Sur. 42. Dry. TD 1,127 ft.

District 4

Cameron County: Phillips Petroleum Co. 1 McElhannon, Block 240, Espiritu Santos Sur. Dry. TD 9,870 ft.

Jim Hogg County: General Well Service, Inc., 1-A Carlos de Guerra, Block 13, Las Cuevitas Sur., A-135. Dry. TD 2,550 ft.

Texita Oil Co. and Parker & Gill 1 Villarreal et al, Block 6, Share F, NE½ Charco Redondo Grant. Dry. TD 2,449 ft.

San Patricio County: Appell Oil & Gas Co. 3 Brown, Block 15, Juan Delgado Grant. Dry. TD 5,071 ft.

Plymouth Oil Co. 16-E Welder, Section 15, Welder Ranch Subd. Dry. TD 7,200 ft.

Webb County: O. W. Killam 3 Walker, Block 2, CCSD&RGNG Sur. 52. Dry. TD 3,320 ft.

Zapata County: Blanco Oil Co. 1-C Hinnant, Lot 7, H&GN Sur. 10, A-477. Temporarily abandoned. TD 6,191 ft.

Chizum, Rhodes & Hicks and Pratt-Hewitt Oil Corp. 1 Trevino, Block 84, McCullough Subd., El Grullo Grant. Dry. TD 1,715 ft.

TEXAS GULF COAST

District 2

Bee County: Bridwell Oil Co. 1 Salinas, Refugio County School Land Sur., A-557. Dry. TD 4,480 ft.

Calhoun County: Humble Oil & Refining Co. 1 State, Tract 93, Matagorda Bay. Dry. TD 6,007 ft.

Goliad County: Daugherty & Kidd 1 Wells, James Dinsmore Sur., A-117. Dry. TD 4,010 ft.

Jackson County: Sun Oil Co. 1 Bain, Wash Beaty Sur., A-98, and J. Yeamons Sur., A-304. Dry. TD 5,657 ft.

Live Oak County: Arnold O. Morgan 1 Cartwright, Block 38, F. Dietrich Sur., A-167. Dry. TD 4,500 ft.

District 3

Brazoria County: C. W. Vick 1 Texas Gulf Producing Co. et al, H&TB Sur. 35, A-252. Dry. TD 7,717 ft.

WILDCAT COMPLETIONS

Brazos County: Slick Oil Co., Ltd., 1 Weedon, Thomas J. Alcorn Sur. Dry. TD 5,959 ft.

Fort Bend County: W. A. Stockard 1 Tucker, I&GN Sur. 1, A-267. Dry. TD 7,758 ft.

Galveston County: John W. Mecom 12-B Maco Stewart, W. K. Wilson Sur., A-28 (Gillock area). Dry. TD 9,369 ft.

Hardin County: W. P. Luse and J. B. McAdams et al 1 Turner heirs, Turner & Von Rosenberg Sur., A-585. IP 57 BOPD, ⅛-in., 36.7°, perforations 8,026-30 ft. TD 9,718 ft. (New field—Yonajosa.)

Harris County: W. B. Trammel and C. B. Webster 1 Fisk, Elizabeth Smith Sur., A-70. Dry. TD 7,020 ft.

Jefferson County: Colorado Oil & Gas Corp. et al 1 Dishman, F. T. Smith Sur. 2, A-807. Dry. TD 8,000 ft.

Lee County: W. J. O'Rourke 1 Willie-Falke, James Hudson Sur. Dry. TD 3,741 ft.

Matagorda County: Luling Oil & Gas Co. 1 Neal, John Smith & Hugh McKenzie League, A-91. Dry. TD 6,224 ft.

Phillips Petroleum Co. 1 Pierce, Nicholas Clopper Sur., A-16. Dry. TD 12,505 ft.

Orange County: J. C. Means, Jr., and William Seale 1-A Powell, Harvey VanWay Sur., A-412. IP 314.87 BOPD, 10/64-in., 37°, Hackberry sand 8,234-36 ft. (perforations). TD 8,916 ft. (New field.)

Polk County: American Liberty Oil Co. and Webb & Knapp, Inc., 1 Cameron heirs, J. Poitevent Sur. 49, A-498. Dry. TD 12,728 ft.

EAST TEXAS

Cherokee County: Bill R. Tipton 1 Gill, Wm. Gates Sur., A-19. Dry. TD 4,165 ft.

Gregg County: Carter-Jones Drilling Co. 1 Bradley, Isaac Lee Sur., 1 mi. W Eaton. Dry. TD 7,874 ft.

Harrison County: Bobby Manziel 1 Blalock, Francis Wilkison Sur., A-795. Dry. TD 6,960 ft.

Henderson County: Amerada Petroleum Corp. 1 Howard-Evans, Thomas Parmer Sur., A-782. Dry. TD 9,010 ft.

Stroube & Stroube and L. A. Grelling 1 Hardee, Simon Weiss Sur., A-799. Dry. TD 5,200 ft.

Kaufman County: Thos. D. Humphrey & Sons 2 Legg, Timothy Devore Sur. Dry. TD 6,868 ft.

Leon County: Falcon Oil Corp. 1 Ester Willman, Thos. H. Garner Sur., A-6. Dry. TD 8,425 ft.

Navarro County: John B. Coffee 1 Adams, Mathew Boren Sur. Dry. TD 3,033 ft.

Halbert Drilling Co. 1 Stockton, E. Powers Sur., A-633. Dry. TD 3,505 ft.

Rusk County: McAlester Fuel Co. 1-A Henry Thornton Unit, Isaac Hicks Sur. Dry. TD 7,142 ft. Elev. 384 ft., Travis Peak 7,020 ft.

Sabine County: Benedum-Trees Oil Co. 1 Pickering Lumber Co., F. J. Ballinova Sur., A-89. Dry. TD 6,610 ft.

Upshur County: Bert Fields 1 Futrell, James Scott Sur., A-440. Dry. TD 8,107 ft.

Stephens, Coats & Moore 1 Duffey, P. F. Renfro Sur. Dry. TD 6,203 ft.

Van Zandt County: L. A. Grelling 1 Teel, Esther Edwards Sur., A-236. Dry. TD 5,087 ft.

TEXAS PANHANDLE

Hansford County: Sharples 1 Henderson, 45-95, H&TC. IPF 48 BOPD, 7,700 M.c.f. of gas per day. TD 7,570 ft. (Gas-distillate discovery).

WEST CENTRAL TEXAS

Brown County: Arnold M. Gurley 1 Louise & Denton, Sec. 12, HT&B Sur., A-1132. Dry. TD 1,003 ft.

Wico Oil Co. 1 Evatt, Sec. 4, BBB&C. Dry. TD 1,021 ft.

Callahan County: Bridwell Oil Co. 1 Webb, Sec. 91, T&P Sur., A-396. Dry. TD 3,751 ft.

Fletcher Oil & Gas Drilling Corp. 1 Windham, Sec. 159, GH&H Sur. Dry. TD 2,558 ft.

R. D. Jackson and C. B. Frost 1 Booth, Samuel St. John Sur. Dry. TD 1,917 ft.

Schkade Bros. Drilling Co. 1-B Jackson, Sec. 19, ETRR Sur. Dry. TD 798 ft.

Twin Oil Corp. 1 James, John Smith Sur. 231. Dry. TD 3,042 ft. Elev. 1,636 ft., Caddo 3,003 ft.

J. D. Wrather 1 Stella Webb, Sec. 95, BBB&C Sur., 2 mi. NW Baird. IP 137 BOPD, 16/64-in., 45°, TP 100 psi., GOR 291, Ellenburger 4,591-97 ft. TD 4,597 ft.

Coleman County: McQueen & Stout 1 McCulloch, Bradford Fowler Sur. 488. Dry. TD 2,100 ft.

Comanche County: J. E. Connally 1 Short, 34-2-H&TC. Dry. TD 3,331 ft.

Haskell County: Eastland Oil Co. and Wayne Petroleum 1 Wilson, R. Finch Sur. Dry. TD 5,796 ft. Elev. 1,585 ft., Caddo 5,529 ft.

F. Kirk Johnson 1 Hansen, A. Bagley Sur. 152. Dry. TD 3,550 ft.

Ultra Oil Co. 1 Sallie Fields Tanner Unit 1, 234-45-H&TC. Dry. TD 5,875 ft.

Wayne Petroleum and Eastland Oil 1 Simms, 5-2-H&TC. Dry. TD 5,875 ft. Mississippian 5,822 ft.

Jones County: Mineral & Royalty Co. 1 Barnhouse, Blk. 2, Goliad CSL Sur. 3585. Dry. TD 3,302 ft.

Shackelford County: Cascade Petroleum Co. 1 Downs, 59-14-T&P. Dry. TD 4,887 ft. Elev. 1,762 ft., Ellenburger 4,810 ft.

Sinclair Oil & Gas Co. 1 Elliott, Sec. 49, BOA Sur. Dry. TD 4,156 ft.

Woodson Oil Co. 1-D Hendrick, Sec. 177, ETRR Sur. Dry. TD 1,588 ft.

Taylor County: Jack N. Blair 1 Jacobs, 7-18-T&P. Dry. TD 3,060 ft.

Dugger & Herring 1 Archie Boyd, 36-19-T&P. Dry. 2,654 ft.

NORTH TEXAS

Archer County: Akin & Dimock 1-A Cowan, J. W. Snell Sur., A-386. IP[D] 93 BOPD, 39°, Cisco 1,328-33 ft. TD 1,490 ft.

Archer Drilling & Production Co. 1 Cowan & McKinney 3, Blk. 160, R. Carson Sur., A-88. Dry. TD 1,295 ft.

G. E. Kadane & Sons 1-C Barry, A. Nunley Sur., A-320. Dry. TD 3,480 ft.

Baylor County: Lloyd, Menefee & Parsley 1 Richardson, Sec. 3102, TE&L Sur. Dry. TD 2,010 ft.

Lloyd, Menefee & Parsley 2 Richardson, Sec. 3101, TE&L. Dry. TD 2,010 ft.

West Central Drilling Co. 1 Ed Hajek, Sec. 92, T&NO Sur. Dry. TD 1,778 ft.

Clay County: J. W. Baldwin 1 Lyon, Blk. 48, Byers Bros. Subd. Dry. TD 1,956 ft.

L. T. Burns 1-A Brown, Blk. 22, Orange CSL Sur., A-368. Dry. TD 5,088 ft.

L. T. Burns 1 Godfrey, TE&L Sur. 3281, A-642. Dry. TD 4,547 ft.

S & S Drilling Co. 1 Landrum, Blk. 5, Parker CSL Sur., 2 mi. SE Petrolia. IP 249 BOPD, 14/64-in., 43°, TP 100 psi., GOR 300, Cisco 1,768-70 ft. TD 1,779 ft.

Cooke County: R. B. Reinhart 1 Field, J. B. McClyman Sur., A-735. Dry. TD 2,308 ft.

J. K. Wadley 1 Block, D. Sackett Sur., Blk. 1, A-940. Dry. TD 1,977 ft.

Jack County: L. T. Burns 11 Bloodworth, W. McDonald Sur., A-380. Dry. TD 5,375 ft.

Howard S. Cole 1 Easter, A. Benton Sur., A-37. Dry. TD 3,318 ft.

LaGorce Oil Co. and P-M Drilling Co. 1 Holman heirs, P. H. Rice Sur., A-1422. Dry. TD 4,970 ft.

Miller & Banks 1 Moore, TE&L Sur. 2016. Dry. TD 2,162 ft.

Perkins & Cullum 1-A Roney, TE&L Sur. 3320, A-743. Dry. TD 3,423 ft.

Knox County: Buffalo Oil Co. 1 Maloney, R. Williams Sur., A-216. Dry. TD 4,606 ft.

Montague County: Marshall Pipe & Supply Co. 1 Hill, J. Cummings Sur., A-152. Dry. TD 5,512 ft.

Transcontinental Oil Co. 1-A Parr estate, E. Wingate Sur., A-836, 2 mi. SW Mallard. IPP 10 BOPD, 41°, Strawn 5,542-52 ft., GOR 350. TD 7,160 ft.

Wichita County: J. C. Moore 1 Summers, Blk. 1, Wyatt Subd. Dry. TD 648 ft.

Thompson & Ryan 1 Tide Water-Sunray, A-432, H&GN Sur. Dry. TD 675 ft.

Wilbarger County: Gray Oil Co. 4-K Waggoner, 10-14-H&TC, 3 mi. SW Harrold. IPP 104 BOPD, 36°, GOR 400, Canyon sand 3,142-52 ft. TD 3,152 ft.

W. A. Lofton 1 Smith heirs, 30-15-T&TC, A-1921. Dry. TD 4,820 ft.

Lloyd Patton 2-C Waggoner, J. D. Purnell Sur. Dry. TD 1,915 ft.

Lloyd Patton 1-D Waggoner, 11-14-H&TC. Dry. TD 3,257 ft.

Scott Brothers & Douglas Whitaker 1 Ancell, 35-6-H&TC. Dry. TD 4,027 ft.

Wise County: Christie, Mitchell & Mitchell 1 Deavers, A. Blount Sur., A-30, 4 mi. SE Hodge field. IP 1,410 M.c.f., plus 10 bbl. distillate per M.c.f., 16/64-in., TP 936 psi., conglomerate 5,766-5,876 ft. TD 5,876 ft.

Young County: Bill Lisle 1 Wilborn, TE&L Sur. 82, A-358. Dry. TD 1,239 ft.

Leo Vesenmeier Jr. 1 Askew, John Driver Sur. 13, A-1590. Dry. TD 3,993 ft.

WEST TEXAS

Andrews County: U. S. Smelting Refining & Mining Co. 1 Byers, 19-A50-PSL. Dry. TD 8,102 ft.

Irion County: Lynn Durham and A. A. Bradford 1 Keuran, 24-1-H&TC. Dry. TD 950 ft.

Kent County: Woodson Oil Co. 1 Messengill, 25-5-H&GN. Dry. TD 7,990 ft. Elev. 2,382 ft., Ellenburger 7,839 ft.

Schleicher County: Humble Oil & Refining Co. 1-B Mayer, 1-A-GC&SF. Dry. TD 8,195 ft. Elev. 2,432 ft., Ellenburger 8,126 ft.

WEST TEXAS BORDER COUNTIES

Coke County: Plymouth Oil Co. 3 Hickman, Sec. 961, S. A. Maverick Sur. Dry. TD 3,697 ft.

Fisher County: A. V. Jones & Sons 2 National Gypsum Co., 279-2-H&TC. Dry. TD 4,070 ft.

Nolan County: Choya Drilling Co. 1 Sears, 151-1A-H&TC. Dry. TD 7,873 ft. Elev. 2,483 ft., Ellenburger 7,475 ft., Cambrian sand 7,848 ft.

Stonewall County: J. A. McRae 1 Baldwin, 14-D-H&TC. Dry. TD 6,095 ft.

Union Oil Co. of California 1 Alexander, 18-F-H&TC. Dry. TD 5,903 ft.

NORTHERN NEW MEXICO

McKinley County: Marshall Drilling Co. 1 Beal-Miller, C SE SE 3-15n-19w. Dry. TD 7,218 ft. Pre-Cambrian.

Rio Arriba County: Magnolia Petroleum Co. 1 Schmitz, C NE SE 34-24n-1w. IP 2,415 M.c.f. of gas per day, Torreon gas discovery, new field. TD 8,930 ft. Chinle.

James T. Watson 1 Pack, NE SW SE 35-24n-4e. Dry. TD 4,205 ft. Pennsylvanian.

San Juan County: Aztec Oil & Gas Co. 1 Ute Indian, NW SE SE 10-31n-15w. Dry. TD 2,645 ft. Dakota.

(Continued on page 163)

PERSONALS

Scientist Honored

A. G. Oblad to succeed Hughes in A.C.S. post

CHAIRMAN-ELECT of the American Chemical Society's petroleum chemical division is Dr. Alex G. Oblad, a brainy, soft-spoken young scientist with Houdry Process Corp., Marcus Hook, Pa.

He will succeed Dr. E. C. Hughes, research manager of Standard Oil Co. (Ohio), whose term expires in September 1955 *(The Oil and Gas Journal, November 22, page 175).*

The 2,700-member petroleum division is the largest branch of the American Chemical Society and one of the most influential of the oil industry's numerous technical organizations. Dr. Oblad has been active in the organization for years and served as secretary-treasurer in 1952-53. This year, he was appointed to the newly-created post of managing editor for publications.

Career . . . Dr. Oblad joined Houdry Process Corp. in 1947 as director of chemical research. In 1952, he was promoted to associate manager of Houdry's research and development division, the position he now holds.

Before joining Houdry, he was head of industrial research for the Texas Research Foundation, Dallas. He previously had served as chief of chemical research in the field research department of Magnolia Petroleum Co. and as research chemist for Standard Oil Co. (Ind.).

Dr. Oblad has contributed much to the recent development of new refining processes. He is the author of numerous well-known publications, and he has obtained several patents of importance in the catalytic field. He is perhaps best known for his contributions to fundamental chemistry, hydrocarbons, and catalytic reactions.

Since 1949, he has been a consultant to Catalytic Construction Co., a Houdry subsidiary. He has been active in atomic-energy and petrochemical projects conducted by Catalytic in recent years.

Brother team . . . The Houdry executive is only half of the Oblad family's team of scientists. A brother, Sherman R. Oblad, is a research engineer with Standard of Indiana.

Alex G. Oblad was born in Salt Lake City. He received his B.S. degree in chemistry from the University of Utah in 1933, and his master's degree the following year. He completed his formal education at Purdue University, where he was awarded his Ph.D. in 1937.

Oblad and his wife, Bessie, have five children — Alex Edward, Elizabeth Ann, Virginia Lou, John Riley Baker, and Hayward Brewster. They live at Springfield, Pa.

C. R. Korzekwa has been promoted to production engineer at Hobbs, N. M., by Gulf Oil Corp. Korzekwa had been serving with Gulf at Crane, Tex., as an engineering trainee.

James E. Pew has been reelected president of the National Council for Liquefied Petroleum Gas promotion. Pew, a director of Sun Oil Co., also is manager of the natural-gas and natural-gasoline department of Sun.

J. Howard White, vice president and controller of Shell Oil Co. since 1949, has been appointed financial vice president. **A. A. Buzzi** succeeds White as controller.

Earl E. Wall has joined Louisiana Land & Exploration Co. in New Orleans as a petroleum engineer. Wall had been serving with Brown Brothers et al as a field petroleum engineer at Post, Tex., before joining Louisiana.

Roy W. Siddens, resident operator in charge of Platte Pipe Line Co., at Hiawatha, Kans., has been transferred to Bosworth, Mo.

Jack A. Ramsdell has been appointed geophysical supervisor for Continental Oil Co. at Jackson, Miss. Ramsdell formerly was a geophysicist for Hudson's Bay Oil & Gas Co., Ltd., a Continental affiliate, at Calgary, Alta.

Barrett Booth has been named general superintendent of Houston Oil Co. of Texas, Houston. Booth formerly was district superintendent at Beeville, Tex.

Lyndell L. Tucker, junior geologist with Sinclair Oil & Gas Co., has been transferred to Oklahoma City district office from Tulsa.

Robert R. Park, engineer with Gulf Interstate Gas Co., has been transferred to Houston from Campbellsville, Ky.

Aaron Cawley has joined Forest Oil Corp. as a petroleum engineer at Midland, Tex. Cawley was a former field engineer with Honolulu Oil Corp. at Brownfield, Tex.

T. W. W. Hill, former reservoir engineer with Mene Grande Oil Co. at Anzoategui, Venezuela, has joined Deutsche Vacuum, O.A.G., at Celle, West Germany, as an engineer.

Herbert W. Grindal has been named a director of Cosden Petroleum Corp. Grindal succeeds **B. H. Roth,** who resigned because of ill health.

Robert J. Lantz has resigned as geologist for Union Oil Co. of California at Tulsa and has joined American Stratigraphic Co. at Oklahoma City. Lantz, vice president of Tulsa Geological Society, served with Union for 3 years.

Harry Mathews, field production superintendent in the Levelland, Tex., area for Stanolind Oil & Gas Co., has been elected chairman of the newly organized South Plains chapter of the American Petroleum Institute. Other officers are **Clint Edwards,** Levelland, first vice chairman; and **Nolen Garrett,** Levelland, second vice chairman. The new chapter takes in Lubbock, Hockley, Cochran, Yoakum, Terry, Lynn, Garz, Crosby, Floyd, Hale, Lamb, and Bailey counties, Texas.

M. R. Church has been named head of the newly formed gas division of Shell Oil Co.'s Denver area production department. Church has been with Shell since 1925, and before moving to Denver was senior mechanical engineer at Houston.

Tom B. Campbell, executive of the J. P. Gibbins, Inc., organization in Midland, Tex., has been elected 1955 chairman of the Permian basin chapter of the American Petroleum Institute, replacing **M. R. Hayes,** division superintendent of Phillips Petroleum Co.

PERSONALS

Other newly elected officers are: **Horace J. Shumate,** Gulf Oil Corp., Odessa, Tex., first vice chairman; **Jerry Ormand,** BJ Services, Midland, second vice chairman; and **P. E. Fletcher,** regional production manager for Atlantic Refining Co., Midland, third vice president.

Walter M. Lenamon, petroleum engineer with Magnolia Petroleum Co., has been transferred from Vanderbilt, Tex., to Lake Charles, La.

E. O. Patterson, Jr., has been promoted to division staff engineer by Stanolind Oil & Gas Co. at Houston. Before his promotion, Patterson served as an engineer with Stanolind in the Tulsa office.

Harold E. Mathy, geologist with Continental Oil Co., has been transferred to Jackson, Miss., from Houston.

E. C. McAninch, former Ardmore district vice president of Oklahoma Natural Gas Co., has been promoted to Tulsa district vice president. McAninch succeeds **Oakah L. Jones,** who resigned recently to join Consumers' Gas Co. of Toronto. **Earle E. Garrison,** Oklahoma Natural manager at El Reno, Okla., has been named to succeed McAninch as district manager at Ardmore.

Y. E. (Gene) Hanes, district geologist at Midland, Tex., for Drilling & Exploration Co., Inc., has resigned this position as of December 1 to join Nebo Oil Co., Dallas, as chief geologist.

C. F. Dowd, Tide Water Associated Oil Co., was elected president of the Transportation Club of the Petroleum Industry during its annual meeting at the recent American Petroleum Institute meeting in Chicago. Other officers elected are: **Paul J. Bond,** Pure Oil Co., first vice president; **W. O. Narry,** Richfield Oil Corp., second vice president; **Raymond R. Hooper,** Cities Service Oil Co. (Pa.), secretary-treasurer. Elected by the board of directors: **Paul H. Kuhns,** Continental Oil Co., chairman; **Lee R. Cowles,** Standard Oil Co. (Ind.), vice chairman. Elected members of the board: **J. M. Morris,** Mississippi Valley Barge Line; **H. L. McReynolds,** retired from Socony-Vacuum Oil Co., Inc.; **Paul H. Draver,** Chicago, Milwaukee, St. Paul & Pacific Railroad Co.; **H. E. Coyl,** General American Transportation Corp.; **Don B. Hearin, Jr.,** Hearin Tank Lines; **Thomas G. Rabbitt,** Sun Oil Co.; and **W. H. Adams,** Shell Chemical Corp.

J. M. (Joe) Marsh, former chief petroleum engineer with International Petroleum (Colombia), Ltd., has been named division well supervisor for Imperial Oil, Ltd., at Calgary.

K. F. Huff, Imperial Oil, Ltd., has been appointed temporary secretary of the newly formed Edmonton Geological Society. Other officers appointed were: **D. Shouldice,** Shell Oil Co., secretary, and **D. West** of Socony-Vacuum Oil Co., Inc., treasurer.

W. L. Day, General Crude Oil Co. geologist, has been placed in charge of the company's new office in Midland, Tex., to supervise land and geological work for the company in the Permian and Raton basins and other Rocky Mountain areas.

R. E. McAvey has been named district superintendent by Sinclair Canada Oil Co. at Calgary. McAvey was district superintendent for Sinclair Oil & Gas Co. at Gladewater, Tex., before joining Sinclair Canada.

R. T. Scott has been named division superintendent for the newly created Chicago division of Standard Oil Co. (Ind.) products pipeline department. Scott's division covers movements from the Whiting, Ind., refinery to Detroit, Indianapolis, and Dubuque, Iowa. Other appointments in the products pipeline department include: **M. T. Vance,** named office manager; **R. L. Clapper,** appointed division engineer; **N. F. Tietze,** named district superintendent of Spring Valley, Minn., district; and **R. W. Johnson,** appointed division engineer for Des Moines division.

J. P. Warner, assistant general manager of Esso Standard Oil Co.'s Baton Rouge refinery will become general superintendent of the Baltimore refinery December 1 in a rotational assignment. **Dr. Fred A. L. Holloway,** general superintendent, will succeed Warner at Baton Rouge. Holloway's present post will be filled in rotation by **Charles P. Hoyt, Ralph D. Patch, Donald O. Swan,** and **G. R. Murrell.**

John Watts, chemical engineer with Humble Pipe Line Co., Midland, Tex., has been elected chairman of the Permian Basin section of the National Association of Corrosion Engineers. Other new officers of the Permian Basin section are: **Fred Gipson,** Continental Oil Co., Midland, first vice chairman; **C. C. Michel,** Cardinal Chemical, Inc., Odessa, Tex., second vice chairman; **A. A. Alberts,** Western Co., Midland, secretary; **Harold Winston,** Gulf Oil Corp., Goldsmith, Tex., treasurer; and **Thomas M. Newell,** Neo-Chem Laboratories, Odessa, permanent trustee.

William R. Perdue, Jr., has been elected a director, vice president and treasurer of Ethyl Corp., effective January 1955.

John Skelly has been named district geologist by Seaboard Oil Co. at its new Oklahoma City offices. Southwestern Kansas is also included in the Oklahoma district.

Robert Fisher and **Stanley T. Crossland** have been elected vice presidents of The Texas Co. Fisher, who has been treasurer of the company since 1949, was named financial vice president. Crossland, named vice president and treasurer, is joining Texaco from Ethyl Corp., where he had been serving as vice president, treasurer, and director.

L. H. True, president of Magnolia Pipe Line Co., was reelected committee chairman of the Committee for Pipe Line Companies at the group's meeting in New Orleans on November 15. True was first elected to the position in 1953. Other officers are: **O. Q. Lomax,** president of Humble Pipe Line Co., vice chairman; and **Paul J. Bond,** vice president of Pure Transportation Co., treasurer.

F. A. Menken, vice president and exploration manager of the western division of Tide Water Associated Oil Co., has resigned to enter private consulting practice. Menken joined Tide Water in 1926 and since 1936 has headed the exploration department of the western division.

Gordon W. Van Fosseh has been promoted to exploitation engineer by Shell Oil Co. and transferred to Casper, Wyo. Before his promotion Van Fosseh was a junior engineer with Shell at Houston.

K. S. Andrea, assistant superintendent of Continental Oil Co.'s Billings, Mont., refinery, has been appointed assistant to the vice president in charge of manufacturing. Andrea succeeds **C. B. Round,** recently named assistant superintendent of the Ponca City refinery. **Harold G. Owen,** Houston staff engineer in the petrochemicals department, will become assistant superintend-

PERSONALS

ent at Billings. In two other changes, **Lester H. Barnes,** assistant superintendent in charge of the mechanical division at the Ponca City refinery, becomes assistant superintendent in charge of thermal and catalytic cracking there, and **Loyd Thompson,** mechanical superintendent at Ponca City, succeeds Barnes.

M. H. Robineau, president of Frontier Refining Co., Denver, has been reelected president of Independent Refiners Association of America. All other officers were also reelected. They include: **Max Fisher,** Aurora Gasoline Co., Detroit, first vice president; **Clarence W. Rice,** El Dorado Refining Co., El Dorado, Kans., second vice president; and **James P. Dunnigan,** Producers Refining Co., West Branch, Mich., secretary-treasurer.

R. F. Sturgis, Jr., treasurer of Pure Oil Co., and **D. R. Williams,** manager of the crude oil trading department of Ohio Oil Co., have been elected to the board of directors of Platte Pipe Line Co.

W. W. Flenniken of Denver, retiring president of the Rocky Mountain Oil and Gas Association and a board member of American Petroleum Institute, has been elected a director of Braniff International Airways.

Penn Gooldy, former geologist with Union Oil Co. of California and Horace Goodell, has joined Frontier Refining Co.

J. M. Parker has been elected president of the Billings, Mont., Geological Society. Other officers elected are: **C. E. Carlson,** Mobil Producing Co., first vice president; **J. T. Llewellyn,** Honolulu Oil Corp., second vice president; **John P. Lewis,** Skelly Oil Co., second vice president; and **Wilson Hood,** Ohio Oil Co., treasurer. **Dick Model,** Northern Pacific Railway, and **John Yapunich,** Yapunich - Sanderson Laboratories, were named to the executive board.

Harry G. Waltner, Jr., Standard Oil Co. (N. J.), and **John Post,** Continental Oil Co., have been appointed to the Federal Advisory Council on Employment Security by Secretary of Labor James P. Mitchell. The council will advise the Secretary of Labor and the Federal Department of Health, Education, and Welfare on policy and operations relating to the administration of the federal-state system of employment security agencies.

John A. Tench has been named manager of the Houston refinery of Shell Oil Co. to succeed the late Paul E. Hurley. Tench, who has been with Shell since 1928, had managed the company's Martinez, Calif., refinery since 1949.

R. L. Williams has been promoted to tool pusher in the West Texas division of Delta Gulf Drilling Co. Williams' headquarters will be in Odessa.

George H. Freyermuth has been elected executive vice president of Esso Export Corp. effective December 1. Freyermuth has been manager of the public-relations department of Standard Oil Co. (N. J.), since 1943.

Robert (Bob) Anderson has been promoted to vice president in charge of operations by Hi-Way Refineries, Ltd. Anderson, who was formerly refinery manager for Hi-Way at Saskatoon, Sask., will coordinate the firm's marketing program with its production. **G. Ronald Gray,** former assistant manager of Saskatoon refinery, has been advanced to succeed Anderson. Hi-Way, an independent Saskatchewan firm founded in 1931, was recently purchased by Royalite Oil Co., Ltd. In December the firm will be known as Royalite-Hi-Way, Ltd.

William R. Perdue, Jr., general counsel since 1950 of Ethyl Corp., has been elected treasurer, vice president, and a director of the company effective January 1.

Frank Pool, reservoir engineer with DeGolyer & MacNaughton, Dallas, has joined Landa Oil Co., Dallas, as vice president and chief engineer.

W. H. Pomeroy, Jr., has been elected a vice president of Diamond Oil Well Drilling Co., Midland. Pomeroy was one of the founders of the company.

Merle Becker, independent operator and former president of the Independent Petroleum Association of America, has joined D. D. Feldman Oil & Gas, Dallas, as manager of the company's oil-industry relations. Becker will be responsible for the firm's oil-industry contacts and cooperative deals. Before his I.P.A.A. service Becker was executive vice president of W. C. McBride, Inc.

DEATHS

Dr. Frank M. Seibert, 67, pioneer conservationist and a 36-year veteran with Gulf Oil Corp., died in Houston November 23. Seibert developed a method for recovering oil from oil and salt-water emulsion, later with an associate made the first known separation of hydrocarbons recovered from natural gas. He was a pioneer in the development of drilling muds and use of by-product gases.

Arthur E. McRea, 60, vice president and treasurer of Southern Pipe Line Co., died recently.

Paul English, 57, director and vice president of Three States Natural Gas Co., of Dallas, was killed recently in an airplane crash in Colorado. A son, Raymond, 33, also was killed in the crash.

W. M. Griffith, vice president of Plymouth Oil Co., Sinton, Tex., and four company associates were killed in an airplane crash near Waynesboro, Va., November 20. Others dead as a result of the crash are **A. L. Laskamp,** chief geologist, Sinton; **Dan Graham,** regional geologist, Midland; **Art Soper,** pilot, Sinton; and **Joe Kolodize,** copilot, Sinton. Griffith had been vice president and general manager of Plymouth since 1924.

Ballard E. Barron, 61, Long Beach, Calif., independent, died there recently. Barron had oil holdings in California, Colorado, Texas, and Oklahoma.

William B. Sherbit, 45, an engineer for Magnolia Petroleum Co. at Dallas, died in Dallas November 21.

Durand W. Rogers, toolpusher for Delta Drilling Co. 17 years, died recently at his home in Tyler, Tex.

George P. Graves, 83, retired Oklahoma drilling contractor, died November 20, in Nowata, Okla.

H. B. Houghton, 78, Oklahoma City, pioneer oilman who made a fortune in the Oklahoma City field, died November 19 from injuries suffered in a fall at his home. Houghton went broke drilling dry holes in Oklahoma, Texas, and Louisiana before he struck it rich with 42 producers in the Oklahoma City field.

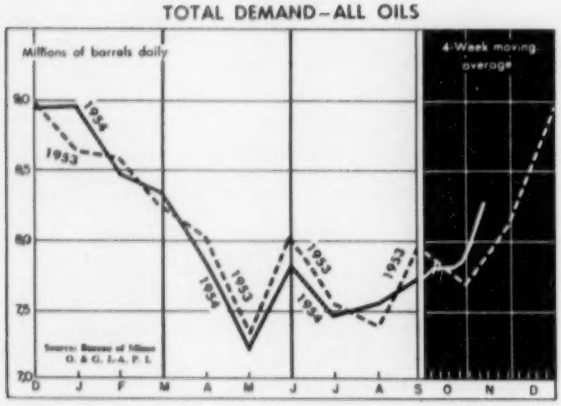
Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,272,425	UP	36,350	DOWN	25,495
Crude stocks	267,049,000	DOWN	3,353,000	DOWN	17,883,000
Completions	1,042	UP	9	UP	36
Refinery runs	*6,883,000	DOWN	58,000	DOWN	68,000
Gasoline stocks	*147,896,000	DOWN	1,242,000	UP	5,060,000
Four-product stocks	*376,898,000	DOWN	4,085,000	UP	12,100,000
Total imports	*1,036,100	DOWN	104,900	DOWN	253,500

*For week ended November 12. (Since press time was advanced 1 day because of Thanksgiving, data from A.P.I. report for November 19 could not be included in this issue. Tables will be carried next week.)

TOTAL DEMAND—ALL OILS



Total L.P.G. Demand First 9 Months Will Match Same Period Last Year

TOTAL demand for L.P.G. in the first 8 months of this year was only 0.8 per cent less than the record demand set in the same period of 1953, and this small deficit may have been made up in September.

Total L.P.G. demand, domestic plus exports, amounted to 76,265,000 bbl. or 314,800 bbl. daily for the January-August period of this year compared with a revised total of 76,873,000 bbl. or 316,300 bbl. daily for the same months of 1953.

Total demand reported by the Bureau of Mines for the 8-month period of 1953 was 80,891,000 bbl., but methods of reporting have been changed in 1954. These revisions should be taken into consideration before comparisons are made between data for this year and last year. *(The Oil and Gas Journal, October 11, 1954, page 109).*

For comparison with the current year, a total of 3,065,000 bbl. should be deducted from the 8-month total in 1953 because of material credited to L.P.G. sales last year which now is listed as going to refineries for gasoline blending.

Also, it is estimated that a total of 953,000 bbl. of L.P.G. was reported as sales in the first 8 months of 1953 which should have been carried as a stock increase. Most of this material went to underground storage. The plus sign in the table indicates that actual inventories increased by 953,000 bbl. in the period. Since material moving to storage should not be considered as demand, this total should be deducted from the original demand total. These revision factors are listed in the bureau's Natural-Gas Liquids report for August. Original demand data are from the bureau's Monthly Petroleum Statement.

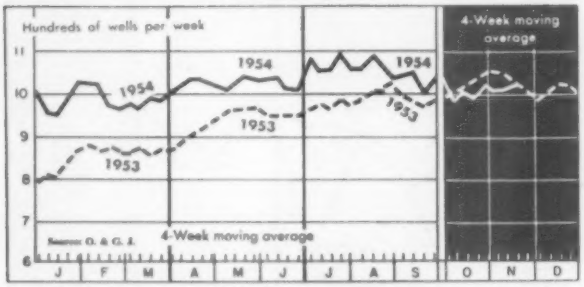
Industry information, reported by the bureau, indicates that about 20,000,000 gal. or 476,000 bbl. remained in underground storage on December 31, 1952, and that this was withdrawn in January 1953. This material was sold in January and should be added to the demand total originally reported for that month.

It was estimated that 60,000,000 gal. was added to storage between January 31 and August 31, 1953. Another 15,000,000 gal. was sent to storage in September. Stocks remained at the 75,000,000-gal. level during October and dropped off at the rate of 25,000,000 gal. per month for the next 3 months.

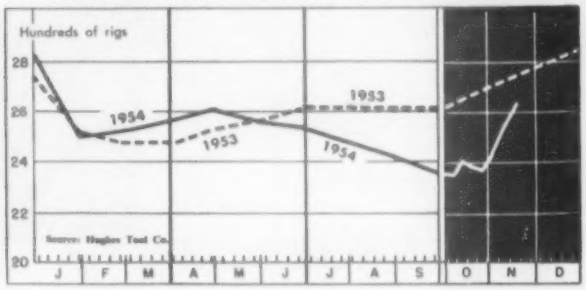
REVISED TOTAL L.P.G. DEMAND—1953
(Thousands of barrels)

	1953				
	Total demand as reported	Revision	Unreported stock change	Revised 1953	Actual 1954
January	11,733	— 584	— 476	11,625	11,856
February-August	69,158	—2,481	+1,429	65,248	64,409
8 months	80,891	—3,065	+ 953	76,873	76,265
September	9,838	— 231	+ 357	9,250	
9 months	90,729	—3,296	+1,310	86,123	
October	9,691	— 216		9,475	
November	10,904	— 489	— 595	11,010	
December	13,103	— 661	— 595	13,037	
Year	124,427	—4,662	+ 120	119,645	

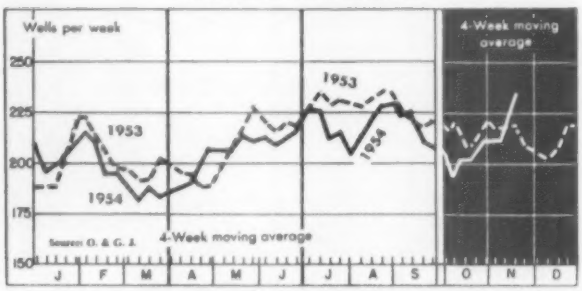
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	11-22-54	Change from 11-15-54	Change from 11-23-53
Gulf Coast	564	16	— 27
N. and W. Texas-New Mexico	831	33	— 43
Arkansas-N. Louisiana-E. Texas	198	12	— 2
Oklahoma	324	8	— 52
Kansas-S. Nebraska	183	8	17
Illinois-Eastern	146	— 2	— 6
Rocky Mountain	251		— 49
Pacific Coast	140	— 2	— 30
Total United States	2,637	73	—192
Western Canada	201	6	52

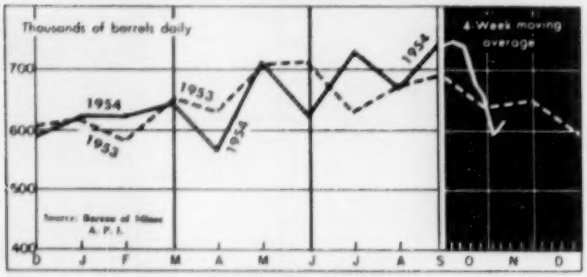
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED NOVEMBER 20, 1954

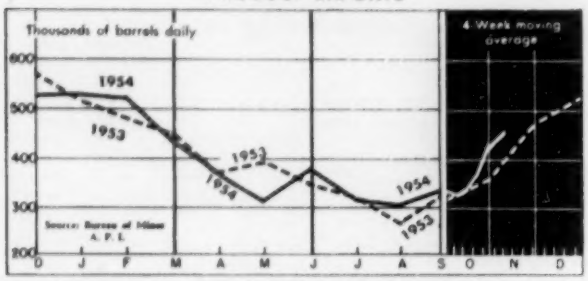
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1954	Cum. 1953	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1954: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	2	0	0	2	8,041	95	128	0	0	0	2	2	2	0	2	82	86
Arkansas	17	9	0	8	71,328	576	508	2	0	0	6	8	23	0	4	108	135
California	55	42	2	11	260,136	2,098	2,274	3	0	1	8	12	54	1	13	461	529
Colorado	38	12	1	25	199,966	1,178	641	2	0	0	13	15	33	0	17	493	543
Illinois	65	39	0	26	146,609	2,743	1,868	2	0	0	11	13	24	0	1	382	407
Indiana	51	3	1	47	77,109	759	1,176	0	0	0	42	42	9	0	1	183	193
Kansas	128	80	16	32	466,847	4,094	4,333	34	0	5	7	46	112	0	29	542	683
Kentucky	23	5	3	15	46,315	1,034	1,024	0	0	0	6	6	16	0	4	120	140
Louisiana	69	41	4	24	366,113	3,126	2,561	1	0	1	10	12	94	50	38	314	496
North	48	29	3	16	157,189	1,733	1,153	0	0	0	7	7	17	3	14	139	173
South	21	12	1	8	208,924	1,393	1,408	1	0	1	3	5	77	47	24	175	323
Michigan	11	3	1	7	30,756	506	552	0	0	0	6	6	15	0	0	188	203
Mississippi	9	4	0	5	69,980	380	361	0	0	0	5	5	10	1	0	143	154
Montana	5	2	0	3	20,624	301	396	0	0	0	3	3	6	0	2	99	107
Nebraska	6	2	0	4	33,851	388	289	0	0	0	2	2	23	0	3	123	149
New Mexico	31	9	15	7	164,823	969	1,294	0	0	1	4	5	19	‡3	‡20	‡93	‡135
Northwest	16	0	13	3	85,949	327	563	0	0	1	3	4	4	0	18	40	62
Southeast	15	9	2	4	78,874	642	731	0	0	0	1	1	15	3	2	53	73
North Dakota	8	4	0	4	59,521	273	243	0	0	0	4	4	5	0	0	102	107
Ohio	19	8	6	*5	39,819	1,033	986	0	0	0	0	0	3	0	5	14	22
Oklahoma	129	89	1	†39	444,969	7,905	6,723	2	0	0	11	13	118	5	23	588	734
Pennsylvania-New York	30	9	11	†10	49,292	1,998	1,997	0	0	0	0	0	0	0	7	35	42
Texas	319	177	11	131	1,384,405	16,439	15,304	8	1	1	94	104	690	65	149	3,701	4,605
Southwest (1 & 4)	39	23	1	15	144,978	2,306	2,483	1	0	0	13	14	97	25	39	637	798
Gulf Coast (2 & 3)	41	20	0	21	278,073	2,358	2,255	2	0	0	15	17	73	32	44	594	743
East (5 & 6)	37	12	2	23	203,964	879	719	0	0	0	15	15	17	0	14	258	289
North Central (7-B & 9)	145	78	5	62	464,431	6,258	5,821	5	0	1	46	52	316	4	21	1,511	1,852
West (7-C & 8)	37	28	0	9	229,134	3,774	3,350	0	0	0	5	5	181	1	22	627	831
Panhandle (10)	20	16	3	1	63,825	864	676	0	1	0	0	1	6	3	9	74	92
Utah	0	0	0	0	0	77	64	0	0	0	0	0	3	0	1	48	52
West Virginia	11	0	8	3	31,931	543	531	0	0	1	0	1	0	0	32	15	47
Wyoming	16	9	0	7	93,337	1,107	744	2	0	0	6	8	35	0	7	175	217
Miscellaneous	0	0	0	0	0	113	68	0	0	0	0	0	3	0	1	35	39
Total United States	1,042	547	80	415	4,065,772	47,735	44,065	56	1	10	240	307	1,297	‡125	‡359	8,044	9,825
Total previous week	1,033	552	81	400	4,254,582			32	4	10	186	232	1,241	122	347	7,806	9,516
Total November 21, 1953	1,006	533	71	402	3,892,339			27	4	6	152	189	1,281	98	325	8,174	9,878

Service wells included: *1, †7, ‡Revised.

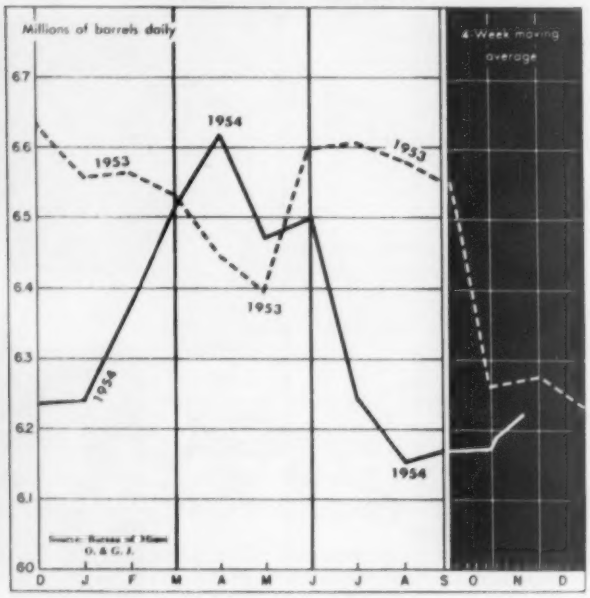
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

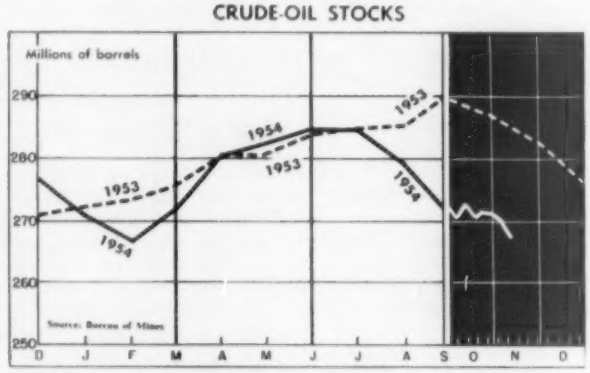


DAILY AVERAGE PRODUCTION FOR WEEK

	November 20 Crude oil	November 20 Lease condensate	November 20 Total	Nov. 13 total
Alabama	4,100		4,100	3,900
Arkansas	71,500	500	72,000	71,850
California	959,500		959,500	960,100
Colorado	142,800		142,800	138,800
Eastern	48,000		48,000	49,500
Florida	1,500		1,500	1,500
Illinois	188,300		188,300	186,700
Indiana	29,400		29,400	28,500
Kansas	321,800		321,800	317,700
Kentucky	38,000		38,000	38,000
Louisiana	587,700	43,700	631,400	631,800
North	101,700	2,700	104,400	104,800
South	486,000	41,000	527,000	527,000
Michigan	33,800		33,800	31,800
Mississippi	88,850	3,900	92,750	92,750
Montana	41,900		41,900	44,100
Nebraska	19,700		19,700	19,500
New Mexico	208,700	2,500	211,200	211,100
North Dakota	18,400		18,400	18,800
Oklahoma	511,900		511,900	480,600
Texas	2,598,300	50,375	2,648,675	2,648,675
Dist. 1	43,000	450	43,450	43,450
Dist. 2	133,000	7,700	140,700	140,700
Dist. 3	408,800	23,750	432,550	432,550
Dist. 4	228,000	5,650	233,650	233,650
Dist. 5	43,000	475	43,475	43,475
Dist. 6	109,700	5,025	114,725	114,725
East Texas field	210,500		210,500	210,500
Dist. 7-B	129,000	25	129,025	129,025
Dist. 7-C	172,000	4,600	176,600	176,600
Dist. 8	848,000	2,025	850,025	850,025
Dist. 9	189,300	625	189,925	189,925
Dist. 10	84,000	50	84,050	84,050
Utah	4,200		4,200	4,700
Wyoming	252,700		252,700	255,400
Others	‡400		‡400	‡300
Total U. S.	6,171,450	100,975	**6,272,425**	6,236,075
Change from previous week, up			**36,350**	
Canada	†285,277		†285,277	†250,600
Total U. S. production January 1-November 20			2,050,262,925 bbl.	
Same period last year (crude plus cond.)			*2,103,652,099 bbl.	

*Includes 29,363,875 bbl. condensate. †Week ended previous Monday. ‡S. D. 100, Nev. 300.

CRUDE-OIL STOCKS



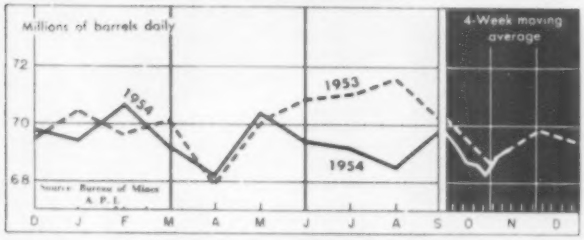
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

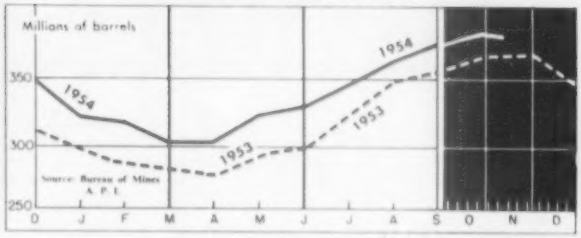
	Nov. 13, '54	Nov. 6, '54	Nov. 14, '53
Pennsylvania Grade	3,265	3,237	2,780
Other Appalachian	1,895	2,028	1,750
Illinois, Indiana, Michigan	12,717	12,263	12,352
Nebraska, N. Dakota	2,129	1,820	(‡)
Kansas	8,527	8,703	8,891
Oklahoma	26,185	26,824	29,747
Arkansas	2,988	3,003	3,402
Louisiana	14,809	14,359	17,354
North	2,293	2,337	3,108
Gulf	12,516	12,022	14,246
Mississippi	3,030	3,004	3,525
New Mexico	8,033	8,699	8,691
Texas	122,063	124,809	134,688
East Texas proper	10,753	11,186	12,063
West Texas	55,013	56,427	58,960
Texas Gulf	23,941	24,587	28,258
Other Texas	32,356	32,609	35,407
Wyoming	13,017	12,889	14,073
Other Rocky Mountain	6,118	5,921	3,178
California	31,923	32,066	32,613
Foreign	†10,350	10,777	11,888
Total	267,049	270,402	284,932

*Bureau of Mines. †Includes 2,682,000 bbl. in California. ‡Included with Kansas.

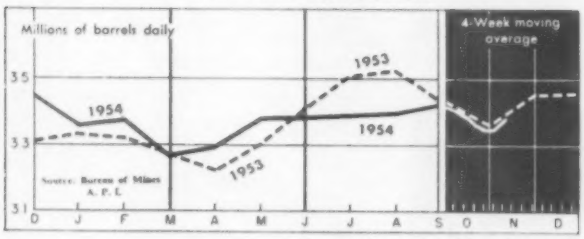
REFINERY RUNS



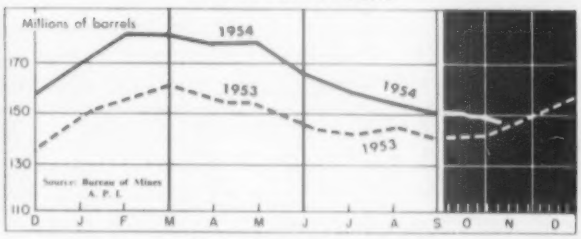
FOUR-PRODUCT STOCKS



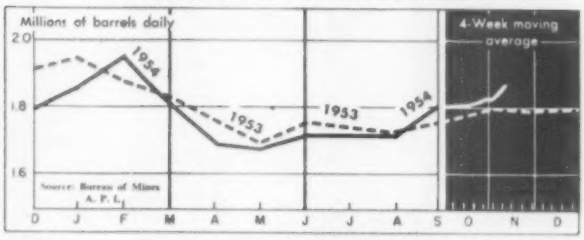
GASOLINE PRODUCTION



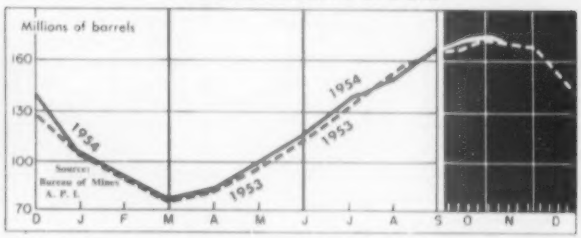
GASOLINE STOCKS



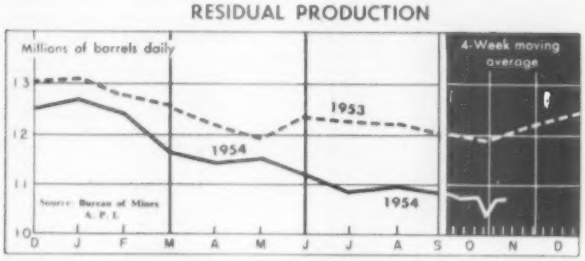
MIDDLE-DISTILLATE PRODUCTION



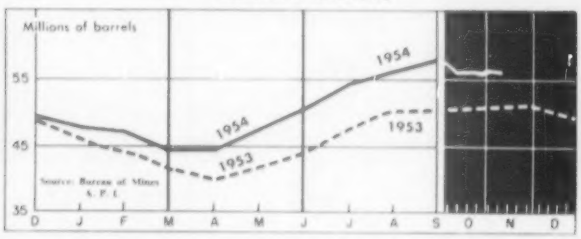
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



Since press time was advanced 1 day because of the Thanksgiving holiday, data from the A.P.I. report for November 19 could not be included in this issue. Complete tables for 2 weeks will be carried next week.

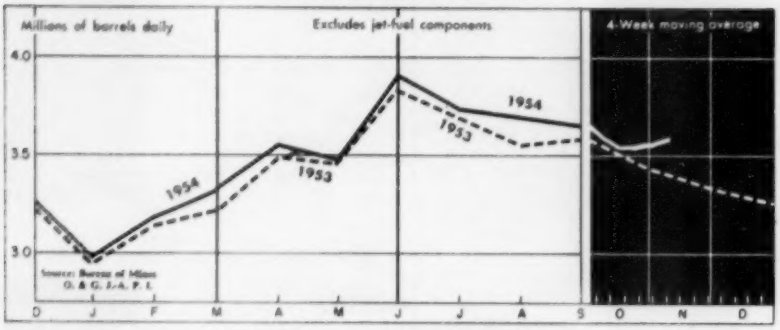
A.P.I. REFINERY REPORT, NOVEMBER 12

(Thousands of barrels)

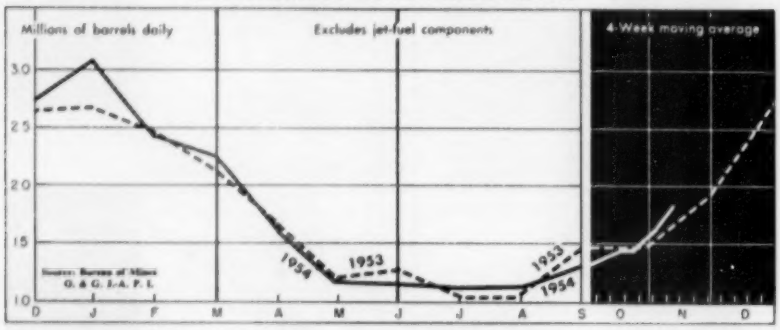
District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, November 1953 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	966	446.9	28.9	281.7	190.1	34,297	14,646	52,132	10,635	1,028	436.8	34.4	247.0	217.2
Appalachian:														
District 1	85	43.4	4.9	20.4	0.3	4,309	749	2,766	555	115	51.7	6.5	24.6	12.5
District 2	70	28.7	4.4	12.3	10.4	2,296	473	783	302	88	45.2	5.7	14.5	11.9
Ind., Ill., Ky.	1,272	683.0	83.8	266.6	176.8	31,470	9,575	25,604	4,245	1,336	738.4	79.9	249.5	195.2
Okla., Kans., Mo.	2,582	343.4	11.6	143.7	44.3	12,927	2,339	12,955	1,364	592	351.3	17.0	133.1	50.3
Inland Texas	217	187.0	10.6	38.6	24.4	5,653	335	2,244	1,335	230	177.7	8.5	42.7	30.9
Texas Gulf Coast	1,709	813.4	101.0	442.1	218.9	19,956	4,327	17,444	5,443	1,692	826.4	123.0	402.2	243.8
La. Gulf Coast	595	314.6	52.1	178.0	42.4	9,472	2,988	4,909	1,297	552	282.8	60.9	124.7	47.0
N. La. and Ark.	91	35.6	7.9	21.7	6.6	3,990	802	1,561	144	88	37.7	8.5	20.1	7.2
Rocky Mountain:														
New Mexico	20	10.9		4.0	2.9	203		83	32	20	12.5	0.4	3.0	3.6
Other Rocky Mt.	219	97.6	3.3	49.9	33.7	4,970	232	2,202	690	219	112.5	4.8	48.9	38.1
California	1,057	447.1	5.4	170.9	370.6	18,353	309	13,476	30,026	1,027	455.9	4.5	153.1	365.1
November 12, 1954	6,883	3,451.6	313.9	1,629.9	1,121.4	147,896	36,775	136,159	56,068	6,987	3,528.9	354.1	1,463.4	1,222.8
November 5, 1954	6,941	3,295.6	342.1	1,475.7	1,119.9	149,138	38,178	137,138	56,469					
November 14, 1953	6,951	3,420.7	317.1	1,422.1	1,179.7	142,836	36,236	134,532	51,194					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.

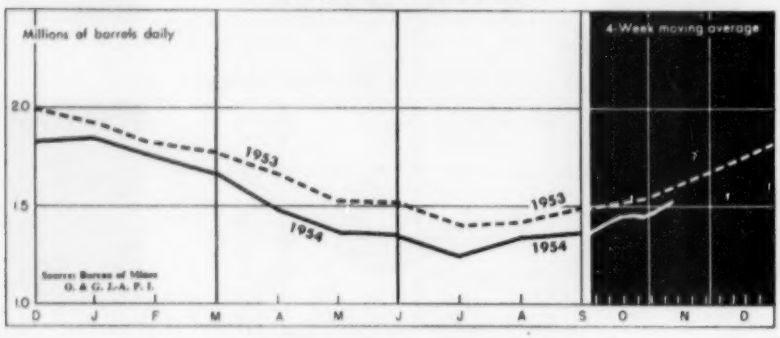
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of November 24, 1954. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.25-11	11.25-12	10.50-10.75
Premium gasoline	11.25-12	13-13.75	11.50-11.75
42-44 w.w. kerosine	9.125-9.25	10.10	9-9.25
No. 2 straw fuel oil	8.375-8.5	9.35	8.5
No. 6 residual	$1.35-1.40	$2.20-2.30	$1.85-1.95

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.5	5.0	5.25
Grade 18-55	6.6	6.1	6.35

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Refiners have been using most of the space in the Great Lakes products line for light fuels. The result has been a near shortage of gasoline at some of the northern terminals. Late harvest demand for gasoline has been very good.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 11-12-54	3,378	3,599
August 1954	3,391	3,649
October 1953	3,359	3,423
November 1953	3,444	3,330
Middle distillate:		
Four weeks ended 11-12-54	1,873	1,865
August 1954	1,755	1,173
October 1953	1,795	1,479
November 1953	1,785	1,926
Residual fuel:		
Four weeks ended 11-12-54	1,086	1,525
August 1954	1,069	1,272
October 1953	1,184	1,521
November 1953	1,223	1,654

CRUDE PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif.*	Okla-homa, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87	....	....	....
15-15.9	1.93	....	....	....
16-16.9	1.99	....	....	....
17-17.9	2.05	....	....	....
18-18.9	2.11	....	....	....
19-19.9	2.18	....	....	....
20-20.9	2.24	$2.50	....	$2.37
21-21.9	2.30	2.52	....	2.39
22-22.9	2.37	2.54	....	2.41
23-23.9	2.45	2.56	....	2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9	....	2.76	3.09	2.63
34-34.9	....	2.78	3.11	2.65
35-35.9	....	2.80	3.13	2.67
36-36.9	....	2.82	3.15	2.69
37-37.9	....	2.84	3.17	2.71
38-38.9	....	2.86	3.19	2.73
39-39.9	....	2.88	3.21	2.75
40 and above	....	2.90	3.23	2.77

•Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Includes New Mexico Permian.

Effective dates: California, February 16, 1953; east of California, June 15, 1953; Pennsylvania Grade, September 1, 1954.

FLAT CRUDE PRICES

Representative posted schedules per barrel

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.23
Middle District	3.15
Southwest Pennsylvania	2.81
West Virginia	2.70
Ohio	2.64
Illinois Basin	2.90-2.95-3.02

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

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$16.00 a column inch one issue . . .
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Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

FOR SALE EQUIPMENT

FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126 Herndon Drilling Company, 421 Mayo Building, Tulsa. Phone 4-9700.

5—C96 CONTINENTAL Engines, complete, and 1—Fairbanks-Morse ZC-346 Engine, complete. These engines purchased new in 1952, and are reconditioned and guaranteed. Priced to sell. Price on request. H. & H. Supply Co., Box 4173, Oklahoma City, Oklahoma.

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

FOR SALE: Three type 80 Cooper Gas Engine Compressors completely rebuilt. Two type 80 Cooper Compressors as is. One 100 H.P. Superior as is or rebuilt. One Clark 100 H.P. Gas Engine driven Compressor. W. S. Smith, 205 Thompson Bldg., Tulsa, Okla.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

GASOLINE PLANT *FOR SALE*

Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Adequate storage tanks for all products. Drum Lead Blending Plant. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Ft. Worth, Texas

USED EQUIPMENT

Franks model 2000 Core Drill double drum drawworks; 48 ft. derrick; 5 x 8 pump; table, swivel, kelly, elevator, elevator links; mounted on 1946 International truck.

Franks SAL 4500 Skid Rotary Rig Cummins Power, 96' Derrick. Located, Tulsa, Oklahoma. O.C.S. Type 3 Servicing Unit mounted on 1942 Mack Truck. Located Odessa, Texas.

Write, Wire or Call

FRANKS MFG. CORPORATION
BOX 3218, WHITTIER STATION
TULSA, OKLAHOMA

FOR SALE EQUIPMENT

FOR SALE: Sullivan 200 complete with all tools ready to work. Located Tulsa, Okla. Contact R. F. Mesker, Phone 6-0057 or 5-9357, Tulsa.

FOR SALE: 5500 ft. Trailer Rig with 7¼" x 14" Gardner-Denver pump, 5" x 10" Gardner-Denver Pump, 5000' of 3½" Drill Pipe, Light Plants, Bunk House and all other necessary equipment to make up complete drilling rig. Perfect Condition. For inventory and price write to Box H-504, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE
WILSON MOGUL 42 ROADARE

Fully equipped with 5000' Grade D & E Drill Pipe, Seven 6¼" Drill Collars, 96' Heavy Duty Mast, F X Z 7¼" x 12" Gardner-Denver Pump, Two WAKDU Waukesha Motors and Miscellaneous Equipment to make complete Drilling Rig. Purchased February 1st, 1953, and Drilled 166,124' of Hole. 1000' above Drill Pipe used on one well. Equipped to Drill 5000'. For Details Contact:

NORTHERN PUMP COMPANY
Chas. J. Beu, Box 94, Telephone 7817, Great Bend, Kansas

or—NORTHERN PUMP COMPANY
Telephone SUNSET 8-8801, Minneapolis, Minnesota

FOR SALE EQUIPMENT

ROTARY RIG COMPLETE: 2,500 to 5,000 ft. capacity. Easily Portable, 4½-in. drill pipe. Double derrick, 7-ft. substructure, Model "S" Cardwell drawworks, 14-in. Gardner-Denver pump powered by LRO Waukesha. Located Grady County, Okla. Now drilling near Duncan. R. V. Dillard, Phone 1177 or write Box 992, Duncan, Okla.

SWEET GASOLINE PLANT LIQUIDATION

HEAT EXCHANGERS—1530, 310, 265, 65, 26 sq. ft.

COLUMNS—84" x 30'; 72" x 28'; 72" x 16'; 60" x 24'; 48" x 24'; 42" x 44'; 36" x 42'; 24" x 45'.

TANKS—Storage & Pressure, 100 to 25,000 gal.

COMPRESSORS—14/11 x 20, 300 PSI; 14/12½ x 20, 175 PSI; 13" x 16", 75 PSI —all gas driven.

PUMPS—Centrifugal—1½" to 8".

BOILERS—150 HP, gas fired, 150 PSI, HRT.

MISC.—Instruments, motors, stacks, pipe, etc.

Heat & Power Co., Inc.
310 Thompson Bldg., Tulsa 3, Okla.—Phone: 3-4890
70 Pine St., New York 5, N. Y.—HAnover 2-4890

DEPENDABLE USED DRILLING EQUIPMENT
At Prices Set to Sell

7¼ x 20" FH-FXL G.D. Slush Pump W/new cylinders, sheave, skid	$18,500
Model "S" Cardwell Rig W/Waukesha WAKU Engine, etc.	3,500
Model "O" Cardwell Rig W/2-Engine Compound, Hyd. Brake	10,000
GA-250-T Emsco Rig W/Sandreel, Foster Catheads, etc.	20,000
Model 5000 Franks Spudder W/Buda LO-235 Engine, mast	5,500
Wilson Giant Drilling Unit W/WAKU Waukesha Engine, etc.	3,000
Wilson Giant 3-Engine Rig W/3 NKU Waukesha Engines	10,000
Wilson Titan 3-Engine Rig, 40" Dbl. Hyd. Brake, less Engines	12,000
A-76 Emsco 5-Sheave Traveling Block	875
Model PCS-1879 Buda Engine W/Butane & Gas Equipment	2,500
GM. Ser. 71 Twin 6 Diesel Engine W/H.D. Power Take-Off	2,500
K-11 Emsco Swivel Complete, factory reconditioned	2,500

Items above selected at random from our used material inventory.

COMPLETE INFORMATION FURNISHED UPON REQUEST TO YOUR CLOSEST CONTINENTAL REPRESENTATIVE

THE CONTINENTAL SUPPLY COMPANY

Dallas, Texas **Pho. PRospect 8541**

FOR SALE EQUIPMENT

GAS METERS. Westcott and Foxboro orifice meters and controllers. Bristol recording pressure gauges. Geo. R. Milner, Box 124, Okmulgee, Oklahoma.

FOR SALE: 3600' 4½" extra hole drill pipe, good for shallow drilling. $.90 per foot. Terms. Melton Supply Company, Box 1360, Seminole, Okla.

ELLIOTT Centrifugal Blower, 14,000 cfm, size 48-A, Type "O," single stage, 2.25 psi, 125 hp Motor. Excellent condition. Refinery Materials Co., Box 14306, Houston.

CORE DRILLS—Acker Model for 150' coring $1855. Acker Model for 350' coring $2715. Acker Model for 800' coring $5410. Everything for well drilling. S. W. Pressey & Son., Pueblo, Colo.

FOR SALE: Liner for 5½" casing, 4" o.d. 8.60 lb., Seamless, 8 rd. 6" new couplings. Strictly number one. Also ideal for gas well. 75c. M. J. Regan Pipe Co., Coffeyville, Kan.

FOR SALE—Horizontal Duplex Steam Pumps—10x8½x12—353 GPM—bronze fitted—max. discharge pressure 100 lbs.—6" suction—5" discharge—mfg. by American Marsh Co. Quantity available—NEW—Boston Metals Co. 313 E. Baltimore St., Baltimore 2, Md., Curtis 7-5050.

FOR SALE: Franks SAL 6000 Rotary, complete and ready for operation. Franks 96-ft. mast, 3-200 H.P. Cummins Diesel engines in excellent condition with V-Belt compounded. Gardner-Denver 7¼x16" Mud Pump with 6' fly wheel, 4-foot substructure, new 1500-foot 1⅛" drilling cable, 6400' of 3½" I.F. 15.5 Drill Pipe, 6 new Drill Collars 6¼"x30', one 8x5x29' Steel Mud Tank, Steel Dog House, Steel Pipe Racks, jets & lines, wrenches, fishing tools, etc. Rig located in Eastern Colorado. Contact Robinson Drilling Company, 1940 So. 11th East St., Salt Lake City, Utah, phone 7-0049, D. V. Robinson. Price: $60,000.00.

Brand new Govt. Surplus For Sale

Substitute Connectors and Drill Collars for use with the FAILING ROTARY WELL BORING RIG, MODEL 314. Write for inventory.

CANTON INDUSTRIAL SALVAGE CO.
1510 Market Ave. S. Canton, Ohio

GASOLINE AND CYCLING PLANT EQUIPMENT FOR SALE

Located in La Rosa Field, five miles south of Woodsboro, Texas, on Farm Road 1360. Plant shutdown in June, 1954. Bid sheets and inventory available upon request.

STANOLIND OIL AND GAS COMPANY
P. O. Drawer 1980
CORPUS CHRISTI, TEXAS

PIPE

77,500 8⅝" O.D. 28.55 lbs. per foot
16,000 12¾" O.D. 49.56 lbs. per foot

The above reconditioned steel pipe is machine cleaned, straight, beveled for welding in 20 foot random lengths.

NEW ELECTRIC WELD PIPE

24" O.D. 2600 feet
26" O.D. 4200 feet
¼" through ⅜" wall
This is structural grade pipe in 40 foot lengths.

For Special Quantity Prices
Write, Wire or Phone

SONKEN-GALAMBA CORPORATION

2nd and Riverview (X-193)
Kansas City 18, Kansas
ATwater 9305

FOR SALE EQUIPMENT

WILSON GIANT—Cheap; 2—Waukesha 145 GK engines in good condition; rig used for work-over. Includes Kelco spinning and Foster Breakout Catheads; pump drive and rotary drive. Call Madison 1923, Houston or Amherst 7-3311, Wichita, or write P. O. Box 2001, Wichita, Kansas.

THREE #12 Sweetland Filters, 48 bronze leaves, monel covered, on 3" C.C., now located in southwest, available for inspection. 11 Sperry 18" x 18" cast iron Filter presses, 11 chambers. Consolidated Products Co. Inc. #65 Garden Street, Hoboken, N. J. N. Y. Tel.: BArclay 7-0600.

GAS COMPRESSORS: XOB I-R's, 90 h.p. Superiors, Type 80 Coopers, Type X Bessemers and Twin Clarks. Extra Cylinders. Alfred B. Kern, 227 Wright Building, Tulsa 3, Oklahoma.

EQUIPMENT WANTED

CASH FOR 28 or 36L Erie-Bucyrus with tools in good condition. Phone 72-4533 or P. O. Box 26, Tulsa.

WANTED—good used 4½" 20#. drill pipe. Give location, quantity and price—Sharp Drilling Company, Box 1271, Midland, Texas.

WE PAY THE MOST for Used Line pipe, used casing, abandoned leases. Gore Oil Field Supplies. Box 1063, Tulsa, Okla.

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma

WANTED

Drawworks, engines and compound capable of drilling 10,000 to 12,000 feet. Give price, description and present location in your reply.

BOX 1845, OKLAHOMA CITY, OKLA.

WANTED
Engines and Compressors

Used Cooper-Bessemer JS 8, LS or LSV units, 1,000 H.P. or over.

Used Cooper-Bessemer GMV 10, GMW or M-Line Compressors.

Box H-480, The Oil and Gas Journal, Tulsa, Oklahoma

HELP WANTED

CHEMICAL OR MECHANICAL Engineer under 35, for responsible position in Alabama Asphalt Refinery. Process or maintenance experience desired. This is good opportunity with established independent. Box H-491, The Oil and Gas Journal, Tulsa Oklahoma.

WANTED: By an independent oil company, a graduate Petroleum Engineer with varied experience in secondary recovery operations in the Tri-State area. Please give full particulars of experience and salary expected in the first reply. Box H-510, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEERS

Experienced graduate engineers or recent graduates, for immediate and future job openings in Saudi Arabia and New York City. For engineering work in development, production, drilling, process, and oil and gas engineering on primary and secondary recovery problems.

Salaries commensurate with education and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 79

ARABIAN AMERICAN OIL CO.
505 Park Avenue, New York 22, N. Y.

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

HAVE OPENINGS for Chemical Engineers on pilot plant operations, with or without experience. Write Mid-Continent Petroleum Corporation, P. O. Box 381, Tulsa 2, Oklahoma.

PROCESS ENGINEER with thorough technical training and background of engineering and operating experience with special emphasis on catalytic and thermal reforming, alkylation, and petrochemicals. Send complete record of education, experience, and minimum salary expected. Write Box H-483, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

DRILLING & PRODUCTION Supt., available, 20 yrs. experience Oil & Gas, 43 yrs. of age, married, sober, best of reference. Box H-505, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—34. Qualified as district manager for independent. Experience in Texas, Colorado, and Wyoming gave a uniform balance of academic, practical, and economic knowledge of finding oil. Currently engaged in subsurface research. Box H-515, The Oil and Gas Journal, Tulsa, Oklahoma.

REGISTERED PETROLEUM ENGINEER, M.S. with seven years varied experience in oil production. Past three years in operating and evaluating water flood properties. Desire responsible position with aggressive independent or individual. Box H-516, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST; 29; Single; B.S. plus graduate studies; 18 months well site geologist, 18 months in geophysics. Desire position in exploration geology—domestic or foreign. Box H-506, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST—36, married; 14 years interpretational experience, including supervisory, with two contracting companies. Desires position as geophysicist with aggressive independent. Supervise crews, evaluate prospects and deals, review previous shooting, integrate geophysical with geologic programs. Box H-524, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, 34, married, five years extensive surface, subsurface and well experience with majors throughout Rocky Mountains. Desire position with individual or independent. Box H-521, The Oil and Gas Journal, Tulsa, Oklahoma.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties, from acquisition to production. No properties too small, and none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited.

Write, wire, or call collect for further information.

MAXIN DRILLING COMPANY
P. O. Box 1628, Hobbs, New Mexico.
Phone 3-3141.
146 Allen Building, Midland, Texas.
Phone 2-2962.

WANTED

LEADING OIL equipment manufacturer wants ideas and new or improved equipment for Refining, Pipeline, Producing or Marketing Divisions. Will acquire small or medium size companies. Our Research Department, manufacturing facilities, capital, management and nationwide sales force are well established and will buy or develop patents or work on royalty or profit sharing basis. Box H-488, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—IDEAS

Inventions that are related or can be adapted to the oil industry. We offer capital, technical advice, patent assistance, market research, a manufacturing plant, and a sales outlet; everything to put your invention on the market. Write P. O. Box 1665, Houston 1, Texas.

ROYALTIES

WISH TO BUY producing royalties. Box H-379, The Oil and Gas Journal, Tulsa, Oklahoma.

JACK EAGLE, Oil Properties, 706 City Nat'l. Bldg., Oklahoma City, Oklahoma, Telephone REgent 6-7027.

OFFERING CHOICE PRODUCING oil income royalties with large reserves per Dollar investments. A. S. Berry, 817 Wright Bldg., Tulsa, Okla.

ROYALTY FOR SALE. Direct offset to most significant Western Kansas discovery in years. Scott County. Contact Kaufman, 830 First National Bank Building, Wichita, Kansas. Phone HO 4-1376.

LEASE AND DRILLING BLOCKS

QUICK CASH for producing Royalties, production, or over-rides. Consider drilling blocks. Robert L. Kinkaid, P. O. Box 26, Tulsa.

HAVE TWO 160 acre leases and need money to drill a Wilcox sand test, or farm out to good operator, structure is high and old wells had Wilcox oil at 3,450 ft. Lewis Short, Burrton, Kansas.

SEE A. L. BOWLES, Box 947, Ada, Okla. for drilling deals and producing royalties if you have the cash for Oil Investments.

Will pay cash instantly for lease (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area

Inquiries Invited

B. D. BUCKLEY

6635 Delmar Ave., St. Louis, Mo.

STRIP LOG CABINETS

MORE LOGS ARE FILED in Kraftbilt Strip Log Cabinets than all others combined! Loaded drawers glide smoothly on roller bearings. Three drawers to section—add sections as needed. Built to last a lifetime! Send for Catalog 352-B. Ross-Martin Co. P. O. Box 800-A, Tulsa 1, Okla.

OIL FORMS

KRAFTBILT FORMS, designed especially for the oil industry, are popular because they are efficient, economical. For all production-reporting forms, plat sheets, all administrative forms, columnar pads, truck reports, material transfer forms, ask for Catalog 854-K. Ross-Martin Co., P. O. Box 800-A, Tulsa, Okla.

GIFTS

EXCLUSIVE hand embroidered OIL DERRICK Neckties in attractive poplin—green, blue, yellow, maroon, brown, red. $2.75 each; $15.00 in lots of six—Cash, check or money order. Allow 15 days for delivery. Eleson Fabric Shop, 875 Broadway, Bowling Green, Ky.

FOR SALE MAPS

The Lafayette Geological Society has available for purchase "Idealized Isometric Block Diagram Maps of South Louisiana, Showing the Stratigraphy of the Miocene as Projected on a Subsea Plane of —7500'."

These maps show the chief Miocene markers found from Marginulina ascensionensis to Bigenerina "A", as they would theoretically outcrop on the above mentioned plane.

They are available in two sizes as follows:

Standard Size — 48"x20½" @ $2.50 ea.
Large (Wall Map) Size—96"x41" @ $4.00 ea.

State number of copies and size desired and mail your order to

T. W. BLACKSTONE,
CITIES SERVICE OIL COMPANY,
Box 1407, Oil Center Station,
Lafayette, Louisiana

Do Not Send Money As You Will Be Billed Directly.

BUSINESS SERVICE

Delaware Corporations formed and serviced, American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

SOIL ANALYSIS

AT LAST, the secret of soil analysis in hunting for oil may be yours. Free details. Surfac Oil Surveys, 1414 Electric Bldg., Fort Worth, Texas.

REAL ESTATE

FOR SALE: Kiowa Oil Company Yard, approximately three acres at Great Bend, Kansas, consisting of: 1 Quonset Building, 100' long, 40' wide, 20'3" high; 2 room office in one end of building, all cement floor, modern. 1 one story duplex building, 4 rooms on each side with bath. 1 Tool shed, 16x30. 1 Tool Building 26x30. 10 Welded Casing Racks made out of 4" drill pipe. 1 Truck Garage, 31x61. Yard is enclosed with 8' Wire Mesh Fence. Contact Kiowa Oil Company, 717 Union National Bank Bldg., Wichita 2, Kansas; phone FO 3-8013.

BUSINESS OPPORTUNITY

ADDITIONAL LINE wanted by small established firm, with history of steady healthy growth; experienced staff, warehouse facilities. Serves Southern California petroleum industry, including majors; drilling, production and refining divisions. Box H-513, The Oil and Gas Journal, Tulsa, Oklahoma.

INCORP. OPERATOR, Southwest Texas will assign override 1/32 in 14 barrels daily producer to anyone granting or procuring twelve months loan of ten thousand dollars, six per cent interest secured by well and 40 acres; well is in operation and pipe line connected. Box H-522, The Oil and Gas Journal, Tulsa, Oklahoma.

ACTIVE COMPANY desires to acquire oil and gas producing properties. All offers will receive full consideration and prompt attention. Box H-523, The Oil and Gas Journal, Tulsa, Oklahoma.

ELECTRIC LOG CABINETS

FOR ECONOMICAL FILING of full-size electric logs, most geologists prefer Kraftbilt E-24 4-drawer Electric Log Cabinet. Two compartments to each drawer with separate follow-blocks make this cabinet handy, economical. For filing reduced electric logs, geologists use Kraftbilt E-28 8-drawer cabinet. Send for Catalog 352-B. Ross-Martin Co., P.O. Box 800-A, Tulsa, Okla.

URANIUM

URANIUM

Purchasers wanted for uranium claims. Evaluated by our company at cost. We get no profit unless purchaser obtains production. Also, we offer a prospecting service with radiation surveys and diamond core drilling on a cost basis plus part interest in claims. Atomic Drilling and Exploration Co., Ltd. P. O. Box 1554—1223 Luisa—Santa Fe, New Mex. Phone 3-4757.

WILDCAT COMPLETIONS

(Continued from page 152)

SOUTHEAST NEW MEXICO

Lea County: Ammco Oil Co. and Coroco Drilling Co. 1 Price, 30-19s-38e. Dry. TD 4,300 ft.

ILLINOIS

Effingham County: Partlow & Cochenour 1 French, NW NW NW 34-7n-7e. IPP 10 BOPD, Cypress 2,486-91 ft. TD 2,493 ft. (Oil discovery).

Macon County: M. H. Richardson 1 Tribby, NE SW NE 32-17n-2e. IPP 70 BOPD, Silurian 1,985-2,019 ft. TD 2,034 ft. (Extends Decatur field).

T. Myers 1 McLaughlin, NE SE NW 21-17n-4e. Dry. TD 2,292 ft.

Macoupin County: V. Jansen-M. Jones 1 Lockyer, NE NW SE 8-7n-8w. Dry. TD 580 ft.

Madison County: Jansen-Spudlick 1 Niehaus, NW SW SE 6-6n-5w. Dry. TD 593 ft.

Marion County: O. Mitton, Jr. 1 Henning, NE SE NW 29-3n-1e. Dry. TD 1,764 ft.

St. Clair County: E. E. Rehn 1 Dahm, NW NE NE 35-1s-7w. Dry. TD 2,190 ft.

Sangamon County: G. F. Chatt 1 Dodd, 15-14n-7w. Dry. TD 1,500 ft.

Washington County: Canter Drilling Co. et al 1 Poggenmoeller, NE SW NW 6-1s-1w. Dry. TD 1,515 ft.

Magnolia Petroleum Co. 1 Storck, NE NW NE 10-1s-4w. Dry. TD 2,503 ft.

Shulman Bros. 1 Seibert, NW NW SE 20-2s-1w. Dry. TD 1,771 ft.

White County: O. D. Sharp 1 Hubele, NE SW SW 15-5s-8e. Dry. TD 3,466 ft.

Williamson County: Calvert Drilling Co. et al 1 Gant, SE NW SE 33-8s-4e. Dry. TD 2,830 ft.

INDIANA

Daviess County: Frank Lyons 1 Lewis, NW NW SE 21-2n-7w. Dry. TD 1,442 ft.

Pearl and Blanche Colby 2 Andis, SW SE NE 4-4n-6w. Dry. TD 747 ft.

Daviess County: Landrey 1 Hughes, NE NW SW 28-2n-5w. Dry. TD 605 ft.

R. I. Smith 1 Williams, SE SE NW 15-4n-7w. Dry. TD 2,364 ft.

Delaware County: Jack S. Lewis 1 Heaton, NW SE SW 18-20n-11e. Dry. TD 1,218 ft.

Dubois County: Henry E. Meister 2 Salb, NE NW SE 14-1s-5w. Dry. TD 633 ft.

C. E. O'Neal Co. 1 Begle, NE NE NW 5-3s-4w. Dry. TD 2,166 ft.

Slim Rea Drilling Co. 1 Hurst, SE NW SW 2-3s-5w. Dry. TD 1,375 ft.

W. L. W. Co. and Otto Walfman Mgr. 3 Sunderman, SW SW NE 17-3s-5w. Dry. TD 1,027 ft.

Gibson County: Francis L. Beard 1 Freudenberger, Fr. 14-1s-10w. Dry. TD 1,750 ft.

Central Drilling Co. 1 Russell & Nola Beasley, SW NW NW 9-2s-9w. Dry. TD 1,761 ft.

R. F. Powers 1 Elkofer, NW SW NE 28-2s-9w. Dry. TD 1,552 ft.

T&H Corp. 1 Deep Vein Coal Co., SW SW NE 2-2s-12w. Dry. TD 2,786 ft.

V. R. Gallagher 1 Higginbotham, NE SW 14-3s-12w. Dry. TD 1,909 ft.

Gibson County: T&H Corp. 2 Princeton, SW NE NE 33-2s-11w. Dry. TD 2,451 ft.

Grant County: Pomeroy Sinnock 1 Carroll, SE SW SE 20-24n-9e. Dry. TD 1,057 ft.

Knox County: H. O. Carr 1 Cato, NW SW SW 29-5n-7w. Dry. TD 1,445 ft.

Knox County: H. O. Carr 2 Cato, SW SW SW 29-5n-7w. Dry. TD 1,031 ft.

LaPorte County: M. Lowenstine-Associates 1 Donald & Stella Zahn, SW NW SW 14-33n-4w. Dry. TD 1,052 ft.

Miami County: Oak Ridge Oil Co. 1 Arch & Esther Butt, W½ SE 14-27n-5e. Dry. TD 934 ft.

Parke County: Reed & Able 1 Poletto, SW NW 4-16n-8w. Dry. TD 1,100 ft.

Pike County: R. D. Brown, Inc. 1 Hicks, NE SW 24-1s-7w. Dry. TD 1,812 ft.

Francis L. Beard 1 Willis, SW SE SE 1-1s-9w. Dry. TD 1,603 ft.

Willis Drilling Co. 1 Nuhring, NE SE SE 15-3s-7w. Dry. TD 1,206 ft.

Posey County: Emil Perper 9 Fifer heirs, SE SE NE 35-3s-14w. Dry. TD 2,180 ft.

Paul F. Goldberg 12-S Fifer heirs, SW SE NW 36-3s-14w. Dry. TD 1,565 ft.

Paco Petroleum Co. 1 Ford, SW SE SW 18-4s-13w. Dry. TD 1,962 ft.

Spencer County: Lawrence & Joe Ayer 1 Chas. & Lucille Ravens, NW NW SW 23-5s-5w. Dry. TD 887 ft.

W. H. Greer 4 Varner, SW NE 19-6s-4w. Dry. TD 914 ft.

Walter Addington 1 Hagen, SW NW NW 24-6s-5w. Dry. TD 1,270 ft.

Sullivan County: The Ohio Oil Co. 1 Stultz,

WILDCAT COMPLETIONS

NE SW 29-7n-9w. Dry. TD 1,669 ft.
B. M. Heath 1-A Templeton Coal Co., SE NW NW 30-8n-8w. Dry. TD 455 ft.
Robert G. Lowry 1 Shew, NW NE SW 15-8n-11w. Dry. TD 1,830 ft.
Granholm & Associates 1 C. L. Drake and Charley Thomson, NW NE NE 33-9n-10w. Dry. TD 2,406 ft.

Sullivan County: Sun Oil Co. 1 Downen-Ind. SE SE NW 8-8n-8w. Dry. TD 1,280 ft.

Vanderburg County: Johnston Drilling Co. 1 Sollman, SE NE NE 22-4s-10w. Dry. TD 1,958 ft.
C. E. O'Neal & Co. 1 Rexing, SE NW NE 32-4n-11e. Dry. TD 2,628 ft.
J. D. Turner 1 Emge, SW NW 19-6s-11w. Dry. TD 1,604 ft.
J. D. Turner 1 Chas. Kissinger Community, SW NW 20-6s-11w. Dry. TD 1,634 ft.
R. E. Hupp 2 Barker-Preston, SE NE NE 36-7s-11w. Dry. TD 2,499 ft.
Calvert Drilling Co. 1 Butterfield, NE NE SW 4-8s-11w. Dry. TD 1,679 ft.

Wells County: Wm. Wolfcale, Jr. 1 Okey, NE NE NW 20-26n-12e. Dry. TD 1,050 ft.

KENTUCKY

Christian County: R. Croft, Trust 1 West, SE SE NE 23-G-26. Dry. TD 865 ft.

Henderson County: Eakle-Holder 2 Cooper, NW NW SE 7-P-22. Dry. TD 1,907 ft.

Hopkins County: H. Adams et al 1 Bailey, NE SW SW 18-I-26. Dry. T D792 ft.

Muhlenberg County: S. B. Griffith 1 Strain, SW SE SE 11-H-29. Dry. TD 1,199 ft.

Ohio County: H. C. Farmer 1 Nall, NE SW SW 15-L-30. Dry. TD 1,975 ft.

Union County: J. D. Turner 1 Goegh, NE NE NW 7-O-19. Dry. TD 2,800 ft.

MICHIGAN

Bay County: Voorhees Drilling Co. 1 Zawacki, NW NE NW 15-18n-3e. Dry. in Richfield, TD 4,452 ft.

Mecosta County: Smith Petroleum Co. 1 Cavanaugh, SE NE SW 18-16n-10w. Dry. TD 3,033 ft. in Traverse lime.

Muskegon County: Ace Oil Co. 3 Sweet-Ames-Lidke, NE NE NW 15-12n-16w. Dry. TD 1,959 ft. in Traverse lime.
R. W. Devine and J. W. Lang Co. 1 Elenbaas, NW SW SW 34-9n-15w. Dry. TD 1,851 ft. in Traverse lime.

Oceana County: The Moco 1 Blohm, SE NE SE 12-15n-18w. Dry. TD 2,239 ft. in Dundee.
Max Spidel 1 Porter, NE NE NE 32-14n-18w. Dry. TD 1,729 ft. in Traverse lime.

WEST VIRGINIA

Jackson County, In Grant district: D. D. Foster 1 H. C. Milhoan, elevation 890 ft., 3,000,000 cu. ft. initial open flow, Oriskany sand 4,468 ft., gas 4,469 ft. TD 4,470 ft.

FLORIDA

Santa Rosa County: The Texas Co. 1 Bailey, SE NW 1-4n-29w. Dry. TD 7,014 ft. Elev. 154 ft., Lower Cretaceous 6,774 ft.

ALABAMA

Cherokee County: R. and J. Westbrook 1 Minton, NW NW 26-12s-10e. Dry. TD 1,027 ft.

MISSISSIPPI

Adams County: D. A. Biglane and Fortenberry Drilling Co. 1 Norman-Breaux, C SW SE 30-5n-3w. Dry. TD 7,235 ft. Elev. 54 ft., Wilcox 4,700 ft., base Baker shale 6,522 ft.
Serio-Punches Oil Co. and Clinch Drilling Co. 1 Davidson et al, 12-5n-2w. Dry. TD 6,767 ft. Elev. 201 ft., Wilcox 4,620 ft., base Baker shale 6,427 ft.

Hinds County: Walter E. Sistrunk 1 Shuff, SE SW NE 27-5n-3w. Dry. TD 3,214 ft. Elev. 245 ft., Wilcox 2,667 ft.
Walter E. Sistrunk 1 Shuff-Beauchamp Unit, NW NW SW 26-5n-3w. Dry. TD 3,240 ft. Elev. 221 ft., Wilcox 2,548 ft.

Stone County: Roseberry & Jackson and Larco Drilling Co. 1 Dantzler, NE NE 13-2s-10w. Dry. TD 8,526 ft. Elev. 85 ft., Lower Cretaceous 8,495 ft.

SOUTH LOUISIANA

Allen Parish: Sun Oil Co. 1 Bel et al, 22-6s-4w. Dry. TD 8,504 ft.

Iberia Parish: Magnolia Petroleum Co. 2-F State Lease 680, Block 88, Eugene Island Area, Gulf of Mexico. IP 50 BCPD and 2,915 M.c.f. daily, 16/64-in., 53.3°, perforations 9,705-10 ft. and 9,690-70 ft. TD 10,305 ft (New pay in Eugene Island Block 110 field.)

Rapides Parish: Crow Drilling Co. and T. L. James 1 Pope, 3-1s-2e. Dry. TD 10,999 ft.

St. Martin Parish: Humble Oil & Refining Co. 1-K Goodrich et al, 30-14s-12e (North American Island area). IP 105 BOPD, $\frac{7}{8}$-in., 26.2°, perforations 2,124-30 ft. TD 2,124 ft. (New field.)
Humble Oil & Refining Co. 7 Duck Lake D-3 gas sand, Township 15s-11e, in Six Mile Lake (Duck Lake area). Dry. TD 12,935 ft.

NORTH LOUISIANA

Claiborne Parish: W. T. McElwee, Jr. 1 Miller, 9-22n-6w. Dry. TD 5,472 ft.

Concordia Parish: Crow Drilling Co. and T. L. James 2 McGee-Evans Land Co., C SE SE 42-6n-9e. Dry. TD 7,009 ft.
Durbin Bond & Co., Inc. 1 Banks, Brown, C SW SW NE 25-7n-6e. Dry. TD 6,210 ft.
Jett Drilling Co. 1 McIntyre, 32-8n-7e. Dry. TD 6,010 ft.
Gauthier & Heard and W. L. Billus 1 Miller et al, C SE SE 1-8n-9e. Dry. TD 6,017 ft.

DeSoto Parish: N. B. Hunt 1 Courtney, 20-14n-13w. Dry. TD 6,828 ft.

LaSalle Parish: Magnolia Petroleum Co. 3 Urania Lumber Co., C NE SW 5-10n-2e. Dry. TD 3,906 ft. Strat test.

ARKANSAS

Calhoun County: Herbert S. Woods 1 Wilson, C NE SW SW 19-14s-13w. Dry. TD 4,685 ft.

Desha County: Delta-Caribbean Oil Corp. 1 Grief Bros., C SE NW 32-10s-1w. Dry. TD 5,295 ft.

Lafayette County: Murphy Corp. 1 Kitchens, C SW NW SE 17-15s-22w. Dry. TD 4,015 ft.
W&S Oil Co. 1 Wheelis, 16-16s-24w. IPF 20 BOPD, 180 BWPD, 22°, Tuscaloosa 2,845-47 ft. TD 2,968 ft. (Oil discovery-Tuscaloosa pay in West Lewisville field).

Miller County: Ed E. Hurley 1 Hartline, C SE SW 14-19s-27w. Dry. TD 7,210 ft.
Carter Oil Co. 1 G.P. Brown Unit, C SW NE 15-19s-28w. Dry. TD 7,190 ft.

Ouachita County: A. V. Beebe and J. S. Beebe, Jr. 1 Sula, C NW SE 16-15s-16w. Dry. TD 4,264 ft.

Union County: E. G. Bradham 1 Horton, C SW SW SW 1-18s-15w. IPP 21 BOPD, 32° Nacatoch 2,160-2,264 and 2,264-66 ft. TD 2,266 ft. (Oil discovery).

OKLAHOMA

Cotton County: Schram-Caudill 1 Goodwin, NE NE NE SW 14-4s-10w. Dry. TD 1,639 ft.

Garfield County: D. D. Feldman et al 1 Moore, SW SE NW 12-21n-3w. IPF 17 BOPD, Red Fork 5,051-93 ft., 38°, 22/64-in. TD 5,648 ft. (Oil discovery).

Kay County: O. H. Parker 1 Couill, SE SE NE 12-26n-3e. Dry. TD 3,496 ft.
Anderson-Prichard Oil Corp. 1 Swingle, NE NE SE 22-26n-3e. Dry. TD 3,656 ft.
C. R. Colpitt et al 1 Schramm, SE SE SE 30-28n-3e. Dry. TD 2-975 ft.

Lincoln County: K. A. Ellison 1 Stasta, NE SE NW 3-12n-6e. Dry. TD 4,570 ft.
Davidor & Davidor 1 Snook, SW SW SW 21-15n-6e. Dry. TD 3,948 ft.
Hubbell 1 Lippert, NE NW NW 33-15n-6e. Dry. TD 3,752 ft.

Noble County: Texas Crude 1 Merritt, NE NW SE 2-23n-2w. Dry. TD 4,737 ft. Geol. wildcat.

Osage County: Glenwood Oil Co.-Sunray Oil Corp. 1 Osage, SW SW SW 31-28n-6e. Dry. TD 3,074 ft.
Wilcox Oil Co. et al 1 Osage, NE NE SE 4-28n-9e. Dry. TD 2,095 ft.

Seminole County: Prudential Oil, Inc. 1 Green, SW SW SW 1-7n-5e. Dry. TD 4,780 ft.
Amarillo Oil Co. 1 Harber, SW NE NE 6-10n-6e. IPP 126 BOPD, Earls 3,634-40 ft., 29°. TD 4,717 ft. (oil discovery).

KANSAS

Comanche County: Rupp-Ferguson 1 Brinkman, NW NW NW 32-31s-18w. Dry. TD 5,261 ft.

Cowley County: Veeder Supply Co. 2 Fulton-Green, SE NW NE 30-33s-6e. Dry. TD 2,340 ft.

Ellsworth County: Shelly-Miller 1 Procheska, SE SE SE 10-16s-8w. Dry. TD 3,025 ft.

Kingman County: Barbour Drilling Co.-Aurora Gasoline Co. 1 Campbell, NE NE SW 15-30s-10w. Dry. TD 4,840 ft.

Rice County: A. R. Jones-Lotus Oil Co. 1 Schroeder, CE½ SE NE 10-18s-9w. IPP 25 BOPD, Simpson 3,289-90 ft. TD 3,290 ft. (new pay in Fredrick field).
Heathman-Seeligson 1 Kasperak, NW SE NW 13-18s-6w. Dry. TD 3,440 ft.

Stafford County: Natural Gas & Oil Corp.-Amerada Petroleum Corp. 1 Cair, NE NW SE 19-22s-14w. Dry. TD 4,051 ft.

Trego County: Stanolind Oil & Gas Co. 1 Rinker, SE NE NW 6-12s-22w. Dry. TD 4,170 ft.

Woodson County: J. H. Wagner 1 Berry, C E½ NW SE 9-25s-14e. IPP 25 BOPD, Miss. 1,619-26 ft. TD 1,626 ft. (Oil and new pay for Stephenson field).

NEBRASKA

Kimball County: Nickle & Marcum 1 Flesner, NW NW NW 19-13n-54w. Dry. TD 6,315 ft.

Sioux County: E. R. McElroy 1 Nash, C NE NE 14-24n-58w. Dry. TD 6,059 ft. Lakota.

NORTH DAKOTA

Burleigh County: Caroline Hunt Trust Estate 1 Nicholson, SE SE 32-137n-77w. Dry. TD 6,156 ft. Winnipeg.

McKenzie County, Poe area: Phillips Petroleum Co.-Gulf Oil Corp.-Skelly Oil Co. 1 Hoehn, C NE SE 113-152n-102w. Dry. TD 13,853 ft. Red River.

Rolette County: British-American 1 Grenier, SW SW 18-161n-70w. Dry. TD 2,996 ft. Nisku.

Stutsman County: Mobil Producing Co. F-35-14-P Wm. J. Gross, NW SE 14-141n-69w. Dry. TD 3,076 ft. Lodgepole.

CALIFORNIA

Butte County: Humble Oil & Refining Co. 2 Investment Co., SW NW 4-19n-1w, IPF 4,000 M.c.f. daily, 36-in. choke, perfs. 3,225-3,300-ft., TD 6,000 ft. (New gas discovery in Llano Seco area 3 miles NE of Beehive Bend field.)

Fresno County: Los Nietos Co., Oper.

WILDCAT COMPLETIONS

38-22 Guijarral Service, SE SW 22-20s-16e, IPF 40 BOPD, ¼-in. choke, 663 M.c.f. gas, 51.7° gravity, perfs. 9,068-9,140 ft., TD 9,746 ft. (Approx. ½-mile northwest extension to Leda pool of Guijarral Hills field.)

Glenn County: Anthony J. Kennedy 1 Torres, 12-18n-2w. Dry. TD 5,262 ft.

Kern County: Merril J. Brown, Oper. 1 Murdoch, 34-27s-28e. Dry. TD 1,760 ft.

E. L. Doheny, Oper. 51 KCL, 9-30s-25e. Dry. TD 4,964 ft.

Kings County: Corwin Drilling Co. 2 Von Glahn Unit, 34-23s-22e. Dry. TD 2,722 ft.

Kern Oil Co., Ltd. 22-13 Unit, 13-21s-18e. Dry. TD 5,500 ft.

Orange County: Atlantic Oil Co. 1 Ramser, NW NW 29-5s-11w, IPF 488 BOPD, 29° gravity, 18/64-in. choke, 500 M.c.f. gas, perfs. 6,106-6,392 ft., TD 6,650 ft. (Approx. ¾-mile southeast extension to Sunset Beach field.)

San Bernardino County: Douglas Marcell, Oper. 1 Puente Hills, 31-2s-8w. Dry. TD 5,918 ft.

Santa Barbara County: George J. Greer 51-17 Bandini, 17-9n-26w. Dry. TD 7,020 ft.

M.J.M. & M. Oil Co. 88-X Thomas, SE SE 15-9n-33w, IPP 75 BOPD, 14° gravity, perfs. 4,779-4,824 ft., TD 4,860 ft. (New basal Sisquoc sand, Pliocene age, ½-mile north of West Cat Canyon field.)

Yolo County: Signal Oil & Gas Co. 1 Signal-Monterey-Browning, 16-12n-1e. Dry. TD 5,000 ft.

MONTANA

Musselshell County, Devils Basin: Amerada Petroleum Corp. 1 Klos, C SW SE 13-10n-25e. Dry. TD 3,274 ft. Otter.

Phillips County, Telegraph Creek: DeKalb-Northern Oil Division 1 Government, C SE SE 2-23n-31e. Dry. TD 6,548 ft. Winnipeg.

Valley County: Plymouth Oil Co. 1 Government, C SE NE 20-26n-39e. Dry. TD 7,449 ft. Cambrian.

WYOMING

Carbon County, Hansen Ridge: Sinclair Oil & Gas Co. 2 Unit, SE SE SE 30-19n-89w. Dry. TD 3,550 ft. Mersaverde.

Lincoln County, Canyon Ranch: Continental Oil Co. 1 Unit, C N½ SW SE 15-25n-114w. Dry. TD 2,915 ft. Ankareh.

Natrona County, Sherwood: Stanolind Oil & Gas Co. 1 Unit, C SE NW 3-40n-77w. IPF 83 BOPD, Lakota discovery, new field. TD 11,512 ft. Sundance.

Niobrara County, Corral Unit: Buck Creek Oil Co. 2 Unit, C NE NW 21-36n-61w. Dry. TD 2,227 ft. Morrison.

Sheridan County, Monarch: C. M. and W. Drilling Co. 1 Sheridan Coal Co., C SE SE 18-57n-84w. Dry. TD 5,245 ft. Shannon.

Washakie County, Blue Ridge Unit: Anderson-Prichard Oil Corp. 1 Unit, W½ NW NW 33-47n-95w. Dry. TD 14,780 ft. Tensleep.

Great Basins Petroleum 12-6, NE NW SW 6-44n-88w. Dry. TD 6,172 ft. Tensleep.

Weston County, Lonetree Creek: Lakota Petroleum 1 Popham, NE SW SE 14-45n-67w. IPF 120 BOPD, Newcastle discovery, new field. TD 8,720 ft. Minnelusa.

COLORADO

Archuleta County: Van R. Turner Drilling Co. 1 Tinker-Flough, SW SE NW 12-34n-1w. Dry. TD 1,470 ft. Dakota.

Francis Bell Harvey 2 Quartz Creek, C SW NW 9-36n-2e. Temp. abd. TD 906 ft. Mancos.

Logan County: Frontier Refining 1 Frasco 2, C NE NW 4-7n-55w. IPF 120 BOPD, "J" sand discovery. TD 5,539 ft.

Shell Oil Co. 1 State 684, C SW NE 14-7n-52w. Dry. TD 4,660 ft.

Shell 1 Hamil, C SW NW 34-7n-52w. Dry. TD 4,691 ft.

Morgan County: Denver Basin 2 Rigsby, SE SE SW 26-6n-59w. Dry. TD 6,576 ft.

Washington County: Al Daniels 1 Collwell, C NW NW 31-4n-54w. Dry. TD 5,128 ft.

Dawson & Cramer 1 McCollister, SE SE SE 18-2n-54w. Dry. TD 5,116 ft.

Plains Exploration 1 Blake, NE NE SW 9-1s-55w. Dry. TD 5,060 ft.

Taylor & Sullivan 1 Reidiss, SE SE SE 9-2n-54w. IPP 165 BOPD, "J" sand discovery, new field. TD 4,866 ft.

Weld County: British-American Oil Producing Co. 1 UPRR "C," SW SE 21-4n-63w. Dry. TD 8,605 ft. Lower Santanka.

Ray Campbell 1 Herman Lingebach, Jr., C SW NW 30-11n-61w. Dry. TD 7,500 ft.

Creslenn Oil Co. 1 Bartmram "A," SW SW NW 12-7n-56w. Dry. TD 5,780 ft.

Don M. Rounds et al 1 Elshoff, NE NE SW 14-5n-61w. Dry. TD 6,866 ft.

Taylor & Sullivan 1 Bain, C NW NW 12-5n-61w. Dry. TD 6,875 ft.

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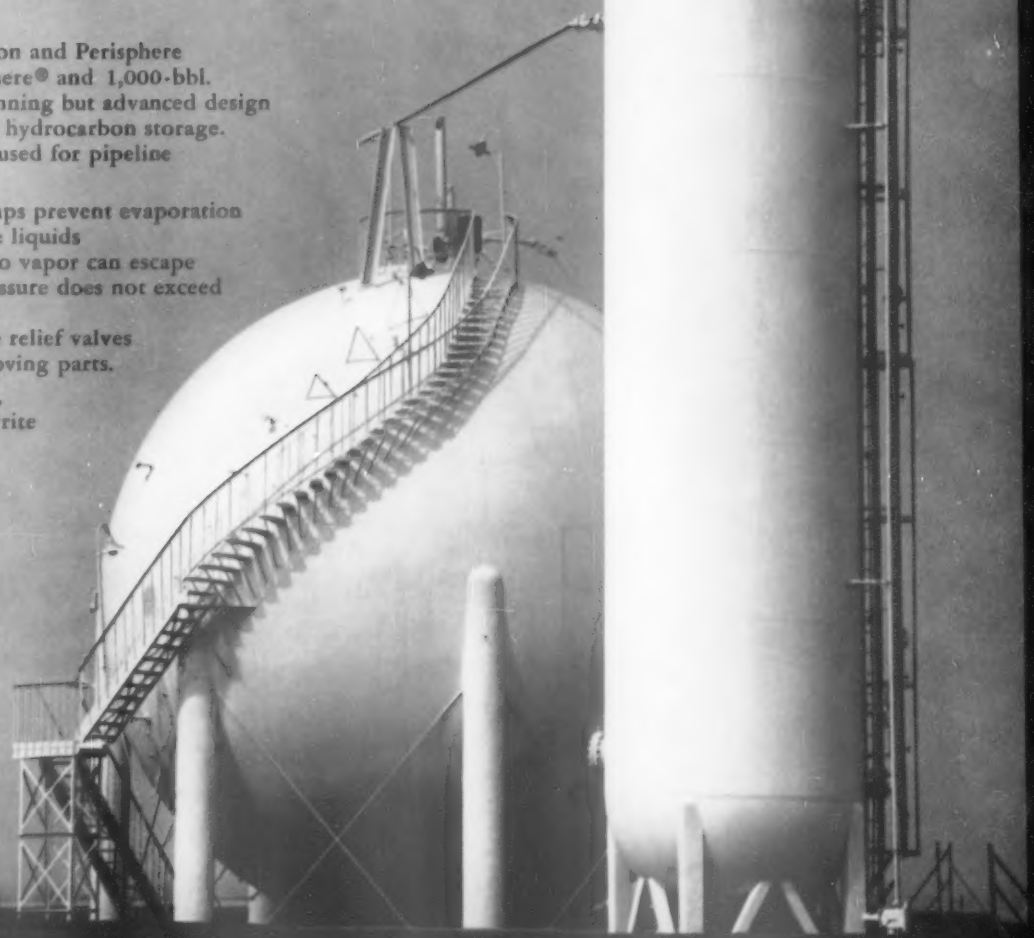

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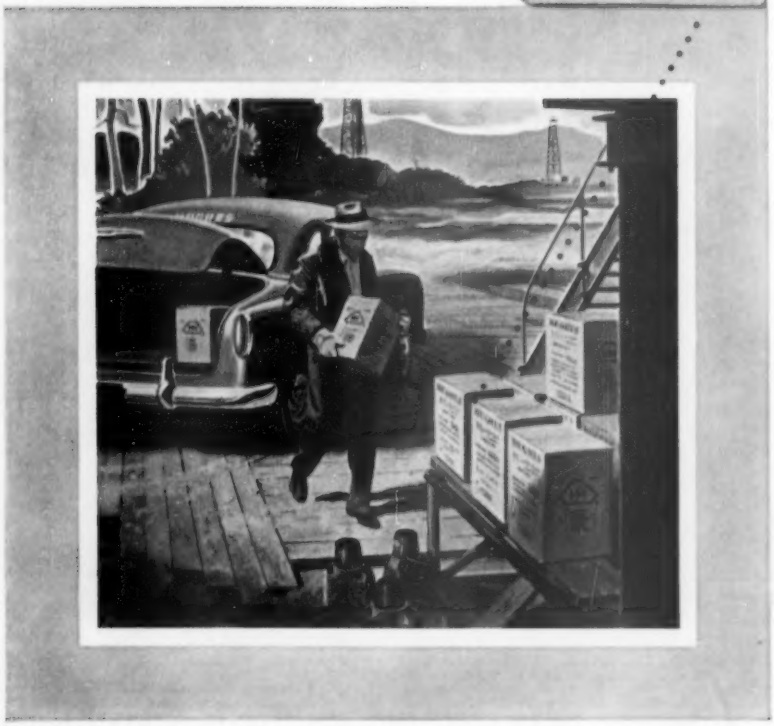
Why Hughes assures you the right bits at the right time



The clockwork delivery of HUGHES bits to your rig is assured before you spud in.

This is made possible by the 400-man HUGHES field service organization working closely with operators in every drilling area in the United States and Canada. Their combined estimates become the basis on which HUGHES' manufacturing schedules are set up.

That's why bits of the correct sizes and types move into our strategically located warehouses well in advance of actual requirements . . . and why you can depend on your HUGHES field service man to have the right bits on your rig at the right time.